

|     |    |            |          |          |          |          |       |
|-----|----|------------|----------|----------|----------|----------|-------|
| N11 | -- | H112 .. S5 | 1.000(4) | 2.471(4) | 3.373(4) | 149.8(4) | 3_756 |
| N12 | -- | H121 .. S1 | 0.999(4) | 2.471(4) | 3.377(4) | 150.6(4) | 3_756 |
| N12 | -- | H122 .. S1 | 1.001(5) | 2.425(4) | 3.412(4) | 169.0(4) | 1_455 |

Translation of Symmetry Code to Equiv.Pos for TC7\_150K

|                  |                        |                  |                        |
|------------------|------------------------|------------------|------------------------|
| a = [ 3_555.00 ] | = -x, -y, -z           | m = [ 4_545.00 ] | = x, -1/2-y, 1/2+z     |
| b = [ 2_655.00 ] | = 1-x, 1/2+y, 1/2-z    | n = [ 4_645.00 ] | = 1+x, -1/2-y, 1/2+z   |
| c = [ 1_455.00 ] | = -1+x, y, z           | o = [ 1_656.00 ] | = 1+x, y, 1+z          |
| d = [ 1_454.00 ] | = -1+x, y, -1+z        | p = [ 1_656.00 ] | = 1+x, y, 1+z          |
| e = [ 3_655.00 ] | = 1-x, -y, -z          | r = [ 4_544.00 ] | = x, -1/2-y, -1/2+z    |
| f = [ 3_655.00 ] | = 1-x, -y, -z          | u = [ 3_655.00 ] | = 1-x, -y, -z          |
| g = [ 4_444.00 ] | = -1+x, -1/2-y, -1/2+z | v = [ 2_645.00 ] | = 1-x, -1/2+y, 1/2-z   |
| h = [ 1_655.00 ] | = 1+x, y, z            | w = [ 2_645.00 ] | = 1-x, -1/2+y, 1/2-z   |
| k = [ 3_756.00 ] | = 2-x, -y, 1-z         | x = [ 4_444.00 ] | = -1+x, -1/2-y, -1/2+z |
| l = [ 4_544.00 ] | = x, -1/2-y, -1/2+z    | y = [ 3_756.00 ] | = 2-x, -y, 1-z         |

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Table S6 - Thiourea cyclooctanone at 293 K

Figure S6 - Thiourea cyclooctanone at 293 K. Atom numbering and anisotropic displacement parameter.

Table S6a - Crystal Data and Details of the Structure Determination for TCO8\_293K

Table S6b - Final Coordinates and Equivalent Isotropic Displacement Parameters of the non-Hydrogen atoms for TCO8\_293K

Table S6c - Hydrogen Atom Positions and Isotropic Displacement Parameters for TCO8\_293K

Table S6d - (An)isotropic Displacement Parameters for TCO8\_293K

Table S6e - Bond Distances (Angstrom) for TCO8\_293K

Table S6f - Bond Angles (Degrees) for TCO8\_293K

Table S6g - Torsion Angles (Degrees) for TCO8\_293K

Table S6h - Contact Distances (Angstrom) for TCO8\_293K

Table S6i - Hydrogen Bonds (Angstrom, Deg) for TCO8\_293K

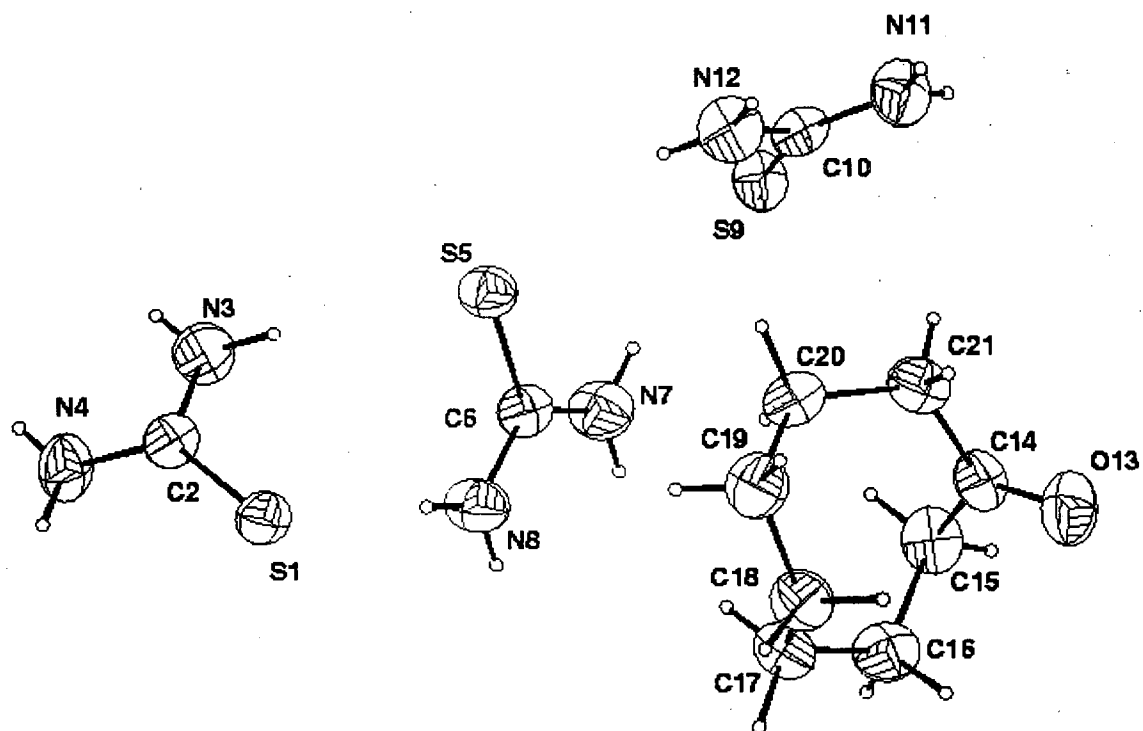


Figure S6 - Thiourea cyclooctanone at 293 K. Atom numbering and anisotropic displacement parameter.

Table S6a - Crystal Data and Details of the Structure Determination  
for TCO8\_293K

| Crystal Data                                                             |                           |             |             |  |
|--------------------------------------------------------------------------|---------------------------|-------------|-------------|--|
| Empirical Formula                                                        | C8 H14 O, 3(C H4 N2 S)    |             |             |  |
| Formula Weight                                                           | 354.59                    |             |             |  |
| Crystal System                                                           | Monoclinic                |             |             |  |
| Space group                                                              | P21/c                     |             | (No. 14)    |  |
| a, b, c [Angstrom]                                                       | 12.2365(15)               | 15.631(2)   | 10.3603(13) |  |
| alpha, beta, gamma [deg]                                                 | 90                        | 111.816(11) | 90          |  |
| V [Ang**3]                                                               | 1839.7(4)                 |             |             |  |
| Z                                                                        | 4                         |             |             |  |
| D(obs), D(calc) [g/cm**3]                                                | 0.000, 1.280              |             |             |  |
| F(000)                                                                   | 760                       |             |             |  |
| Mu(CuKa) [ /mm ]                                                         | 3.8                       |             |             |  |
| Crystal Size [mm]                                                        | 0.20 x 0.30 x 0.60        |             |             |  |
| Data Collection                                                          |                           |             |             |  |
| Temperature (K)                                                          | 293                       |             |             |  |
| Radiation [Angstrom]                                                     | CuKa                      | 1.54180     |             |  |
| Theta Min-Max [Deg]                                                      | 2.2, 74.3                 |             |             |  |
| Scan, (Type & Range) [Deg]                                               | 0.55 + 0.20 Tan(Theta)    |             |             |  |
| Dataset                                                                  | -15: 0 ; -19: 0 ; -11: 12 |             |             |  |
| Tot., Uniq. Data, R(int)                                                 | 4068,                     | 3741,       | 0.040       |  |
| Observed data [F > 3.0 sigma(I)]                                         | 3428                      |             |             |  |
| Refinement                                                               |                           |             |             |  |
| Nref, Npar                                                               | 3428, 191                 |             |             |  |
| R, wR, S                                                                 | 0.0680, 0.0750, 1.07      |             |             |  |
| w = Chebychev polynomial with 3 parameters<br>Carruthers & Watkin , 1979 | 6.83                      | 4.70        | 4.98        |  |
| Max. and Av. Shift/Error                                                 | 0.01, 0.00                |             |             |  |
| Min. and Max. resd. dens. [e/Ang^3]                                      | -0.65, 0.67               |             |             |  |

Table S6b - Final Coordinates and Equivalent Isotropic Displacement Parameters of the non-Hydrogen atoms for TC08\_293K

| Atom | x           | y            | z            | U(eq) [Ang^2] |
|------|-------------|--------------|--------------|---------------|
| O13  | 0.04555(15) | -0.06710(11) | 0.1602(2)    | 0.0691(6)     |
| C14  | 0.11660(17) | -0.01754(13) | 0.1464(2)    | 0.0511(6)     |
| C15  | 0.12311(19) | 0.07209(13)  | 0.2013(2)    | 0.0572(7)     |
| C16  | 0.1837(2)   | 0.07602(14)  | 0.3590(2)    | 0.0595(7)     |
| C17  | 0.3148(2)   | 0.05585(16)  | 0.4165(2)    | 0.0625(7)     |
| C18  | 0.3469(2)   | -0.03584(15) | 0.3903(2)    | 0.0593(7)     |
| C19  | 0.3952(2)   | -0.04574(18) | 0.2756(3)    | 0.0659(8)     |
| C20  | 0.3220(2)   | -0.00949(18) | 0.1350(2)    | 0.0633(8)     |
| C21  | 0.1965(2)   | -0.04350(17) | 0.0732(2)    | 0.0627(7)     |
| S1   | 0.85876(4)  | 0.14292(3)   | 0.46915(5)   | 0.0461(2)     |
| N3   | 0.85670(18) | 0.23495(13)  | 0.2542(2)    | 0.0615(6)     |
| N4   | 1.01658(16) | 0.25245(12)  | 0.4531(2)    | 0.0581(6)     |
| C2   | 0.91423(17) | 0.21545(11)  | 0.3861(2)    | 0.0430(5)     |
| S5   | 0.57078(4)  | 0.15348(3)   | 0.07841(5)   | 0.0482(2)     |
| N7   | 0.40026(17) | 0.23201(13)  | 0.1303(2)    | 0.0602(6)     |
| N8   | 0.56825(17) | 0.20804(12)  | 0.31832(18)  | 0.0582(6)     |
| C6   | 0.50838(17) | 0.20124(11)  | 0.1830(2)    | 0.0442(5)     |
| S9   | 0.21498(4)  | 0.19731(3)   | -0.21114(5)  | 0.0476(2)     |
| N11  | 0.13645(17) | 0.04564(12)  | -0.3148(2)   | 0.0610(6)     |
| N12  | 0.33347(17) | 0.05357(11)  | -0.1915(2)   | 0.0582(6)     |
| C10  | 0.22893(16) | 0.09108(11)  | -0.24091(18) | 0.0430(5)     |

U(eq) = 1/3 of the trace of the orthogonalized U Tensor

Table S6c - Hydrogen Atom Positions and Isotropic Displacement Parameters for TCO8\_293K

| Atom | x           | y            | z          | U(iso) [Ang^2] |
|------|-------------|--------------|------------|----------------|
| H151 | 0.16812(19) | 0.10837(13)  | 0.1588(2)  | 0.0660         |
| H152 | 0.04132(19) | 0.09497(13)  | 0.1745(2)  | 0.0660         |
| H161 | 0.1732(2)   | 0.13510(14)  | 0.3896(2)  | 0.0721         |
| H162 | 0.1440(2)   | 0.03395(14)  | 0.3998(2)  | 0.0721         |
| H171 | 0.3456(2)   | 0.06558(16)  | 0.5193(2)  | 0.0730         |
| H172 | 0.3543(2)   | 0.09617(16)  | 0.3727(2)  | 0.0730         |
| H181 | 0.4077(2)   | -0.05759(15) | 0.4786(2)  | 0.0681         |
| H182 | 0.2743(2)   | -0.07169(15) | 0.3654(2)  | 0.0681         |
| H191 | 0.4738(2)   | -0.01692(18) | 0.3074(3)  | 0.0781         |
| H192 | 0.4054(2)   | -0.10831(18) | 0.2632(3)  | 0.0781         |
| H201 | 0.3621(2)   | -0.02332(18) | 0.0692(2)  | 0.0789         |
| H202 | 0.3182(2)   | 0.05400(18)  | 0.1444(2)  | 0.0789         |
| H211 | 0.2005(2)   | -0.10740(17) | 0.0741(2)  | 0.0741         |
| H212 | 0.1607(2)   | -0.02282(17) | -0.0250(2) | 0.0741         |
| H31  | 0.88580     | 0.27200      | 0.21300    | 0.0723         |
| H32  | 0.78920     | 0.21080      | 0.20780    | 0.0723         |
| H41  | 1.04480     | 0.28940      | 0.41070    | 0.0679         |
| H42  | 1.05630     | 0.24010      | 0.54010    | 0.0679         |
| H71  | 0.36920     | 0.25620      | 0.18440    | 0.0735         |
| H72  | 0.35960     | 0.22820      | 0.04140    | 0.0735         |
| H81  | 0.63980     | 0.18810      | 0.35480    | 0.0701         |
| H82  | 0.53640     | 0.23230      | 0.37140    | 0.0701         |
| H111 | 0.14400     | -0.00850     | -0.32960   | 0.0723         |
| H112 | 0.06720     | 0.06950      | -0.34890   | 0.0723         |
| H121 | 0.39590     | 0.08310      | -0.14350   | 0.0692         |
| H122 | 0.34030     | -0.00050     | -0.20690   | 0.0692         |

=====

The temperature factor has the form of  $\text{EXP}(-T)$  where  $T = 8\pi^2 U \sin^2(\theta/\lambda)$  for isotropic Atoms

Table S6d - (An)isotropic Displacement Parameters for TCO8\_293K

| Atom | U(1,1) or U | U(2,2) | U(3,3) | U(2,3) | U(1,3) | U(1,2) |
|------|-------------|--------|--------|--------|--------|--------|
| ---- | -----       | -----  | -----  | -----  | -----  | -----  |

|     |            |            |            |             |            |             |
|-----|------------|------------|------------|-------------|------------|-------------|
| O13 | 0.0595(9)  | 0.0570(9)  | 0.0912(12) | -0.0082(8)  | 0.0284(8)  | -0.0116(7)  |
| C14 | 0.0459(9)  | 0.0480(10) | 0.0520(10) | 0.0006(8)   | 0.0097(8)  | -0.0008(8)  |
| C15 | 0.0557(11) | 0.0420(10) | 0.0701(13) | 0.0055(9)   | 0.0190(10) | 0.0074(8)   |
| C16 | 0.0734(14) | 0.0452(11) | 0.0654(12) | -0.0067(9)  | 0.0323(11) | 0.0054(9)   |
| C17 | 0.0649(13) | 0.0678(13) | 0.0508(11) | -0.0113(9)  | 0.0170(10) | -0.0073(11) |
| C18 | 0.0540(11) | 0.0656(13) | 0.0515(11) | 0.0115(9)   | 0.0117(9)  | 0.0097(9)   |
| C19 | 0.0498(11) | 0.0769(15) | 0.0707(14) | -0.0037(11) | 0.0220(10) | 0.0110(10)  |
| C20 | 0.0632(12) | 0.0762(15) | 0.0593(12) | -0.0032(11) | 0.0330(10) | -0.0020(11) |
| C21 | 0.0629(12) | 0.0711(14) | 0.0527(11) | -0.0120(10) | 0.0200(10) | -0.0040(11) |
| S1  | 0.0563(3)  | 0.0390(3)  | 0.0457(3)  | 0.0024(2)   | 0.0221(2)  | -0.0068(2)  |
| N3  | 0.0689(11) | 0.0621(11) | 0.0511(9)  | 0.0138(8)   | 0.0194(8)  | -0.0111(8)  |
| N4  | 0.0550(10) | 0.0501(9)  | 0.0654(11) | 0.0116(8)   | 0.0179(8)  | -0.0107(7)  |
| C2  | 0.0515(9)  | 0.0311(8)  | 0.0500(9)  | 0.0006(6)   | 0.0231(8)  | 0.0011(7)   |
| S5  | 0.0514(3)  | 0.0497(3)  | 0.0450(3)  | -0.0027(2)  | 0.0197(2)  | 0.0061(2)   |
| N7  | 0.0600(10) | 0.0622(11) | 0.0610(10) | -0.0054(8)  | 0.0255(8)  | 0.0122(8)   |
| N8  | 0.0640(10) | 0.0637(11) | 0.0482(9)  | -0.0066(8)  | 0.0223(8)  | 0.0055(8)   |
| C6  | 0.0550(10) | 0.0327(8)  | 0.0490(10) | 0.0002(7)   | 0.0241(8)  | -0.0017(7)  |
| S9  | 0.0474(3)  | 0.0353(3)  | 0.0589(3)  | -0.0035(2)  | 0.0182(2)  | 0.0025(2)   |
| N11 | 0.0630(10) | 0.0424(9)  | 0.0804(13) | -0.0166(8)  | 0.0299(9)  | -0.0049(7)  |
| N12 | 0.0610(10) | 0.0443(9)  | 0.0687(11) | 0.0031(7)   | 0.0235(8)  | 0.0133(7)   |
| C10 | 0.0540(10) | 0.0378(9)  | 0.0460(9)  | 0.0025(7)   | 0.0289(8)  | 0.0028(7)   |

=====

The temperature factor has the form of  $\text{EXP}(-T)$  where

$$T = 8\pi^2 U \sin^2(\theta/\lambda) \text{ for isotropic atoms}$$

$$T = \sum_{ij} h_i h_j U_{ij} a_i^* a_j^* \text{ for anisotropic atoms.}$$

$a_i^*$  are reciprocal axial lengths and  $h_i$  are the reflection indices.

Table S6e - Bond Distances (Angstrom) for TC08\_293K

|     |      |            |     |      |          |
|-----|------|------------|-----|------|----------|
| S1  | -C2  | 1.709(2)   | S5  | -C6  | 1.712(2) |
| S9  | -C10 | 1.7090(18) | N3  | -C2  | 1.319(3) |
| N4  | -C2  | 1.319(3)   | N7  | -C6  | 1.320(3) |
| N8  | -C6  | 1.323(3)   | N11 | -C10 | 1.314(3) |
| N12 | -C10 | 1.325(3)   | O13 | -C14 | 1.212(3) |

|     |      |          |     |      |          |
|-----|------|----------|-----|------|----------|
| C19 | -C20 | 1.508(4) | C14 | -C15 | 1.503(3) |
| C14 | -C21 | 1.499(3) | C15 | -C16 | 1.524(3) |
| C16 | -C17 | 1.522(4) | C17 | -C18 | 1.537(3) |
| C18 | -C19 | 1.519(4) | C20 | -C21 | 1.523(4) |

Table S6f - Bond Angles (Degrees) for TCO8\_293K

|     |      |      |            |     |      |      |            |
|-----|------|------|------------|-----|------|------|------------|
| S1  | -C2  | -N3  | 121.05(17) | S1  | -C2  | -N4  | 120.21(15) |
| S5  | -C6  | -N8  | 120.29(17) | N7  | -C6  | -N8  | 119.0(2)   |
| S5  | -C6  | -N7  | 120.75(16) | N11 | -C10 | -N12 | 118.99(17) |
| S9  | -C10 | -N11 | 120.54(16) | N3  | -C2  | -N4  | 118.73(19) |
| S9  | -C10 | -N12 | 120.47(15) | C15 | -C14 | -C21 | 119.4(2)   |
| O13 | -C14 | -C21 | 121.2(2)   | O13 | -C14 | -C15 | 119.4(2)   |
| C14 | -C15 | -C16 | 112.30(17) | C15 | -C16 | -C17 | 115.67(19) |
| C16 | -C17 | -C18 | 115.18(19) | C17 | -C18 | -C19 | 115.6(2)   |
| C18 | -C19 | -C20 | 116.9(2)   | C19 | -C20 | -C21 | 114.8(2)   |
| C14 | -C21 | -C20 | 115.99(18) |     |      |      |            |

Table S6g - Torsion Angles (Degrees) for TCO8\_293K

|     |      |      |      |           |     |      |      |      |          |
|-----|------|------|------|-----------|-----|------|------|------|----------|
| O13 | -C14 | -C21 | -C20 | -141.5(2) | O13 | -C14 | -C15 | -C16 | 75.5(3)  |
| C21 | -C14 | -C15 | -C16 | -105.7(2) | C15 | -C14 | -C21 | -C20 | 39.7(3)  |
| C14 | -C15 | -C16 | -C17 | 68.2(3)   | C15 | -C16 | -C17 | -C18 | -64.1(2) |
| C16 | -C17 | -C18 | -C19 | 103.5(2)  | C17 | -C18 | -C19 | -C20 | -53.8(3) |
| C18 | -C19 | -C20 | -C21 | -56.2(3)  | C19 | -C20 | -C21 | -C14 | 68.0(3)  |

Table S6h - Contact Distances (Angstrom) for TCO8\_293K

|    |        |            |     |        |            |
|----|--------|------------|-----|--------|------------|
| S1 | .N3_k  | 3.524(2)   | O13 | .N11_b | 3.208(3)   |
| S1 | .N8    | 3.462(2)   | O13 | .N4_a  | 3.041(3)   |
| S1 | .N11_j | 3.364(2)   | S5  | .N3    | 3.528(2)   |
| S5 | .N12_j | 3.4928(19) | S5  | .N8_q  | 3.4475(19) |
| S9 | .N7    | 3.462(2)   | S9  | .N7_q  | 3.439(2)   |
| S9 | .C16_u | 3.665(2)   | N3  | .S5    | 3.528(2)   |
| S9 | .N4_s  | 3.530(2)   | N3  | .S1_l  | 3.524(2)   |
| S9 | .N4_t  | 3.532(2)   | N4  | .S9_o  | 3.532(2)   |
| N4 | .O13_n | 3.041(3)   | N4  | .S9_i  | 3.530(2)   |

|     |        |            |     |        |          |
|-----|--------|------------|-----|--------|----------|
| N7  | .S9    | 3.462(2)   | N7  | .S9_d  | 3.439(2) |
| N8  | .S5_r  | 3.4475(19) | N8  | .S1    | 3.462(2) |
| N11 | .O13_c | 3.208(3)   | N11 | .S1_v  | 3.364(2) |
| N12 | .S5_h  | 3.4928(19) | C14 | .C18   | 3.019(3) |
| C14 | .O13_c | 3.331(3)   | C14 | .C14_c | 3.348(3) |
| C16 | .S9_d  | 3.665(2)   | C16 | .C20   | 3.599(3) |
| O13 | .C14_c | 3.331(3)   | C18 | .C14   | 3.019(3) |
| C20 | .C16   | 3.599(3)   |     |        |          |

Table S6i - Hydrogen Bonds (Angstrom, Deg) for TCO8\_293K

| D   | H       | A      | D - H  | H -- A | D --- A    | D H A  | Symm(A) |
|-----|---------|--------|--------|--------|------------|--------|---------|
| N3  | -- H31  | .. S1  | 0.8703 | 2.7639 | 3.524(2)   | 146.79 | 4_554   |
| N3  | -- H32  | .. S5  | 0.8722 | 2.6609 | 3.528(2)   | 172.57 | .       |
| N4  | -- H41  | .. O13 | 0.8709 | 2.4879 | 3.041(3)   | 122.06 | 2_655   |
| N4  | -- H41  | .. S9  | 0.8709 | 2.8154 | 3.532(2)   | 140.63 | 4_655   |
| N4  | -- H42  | .. S9  | 0.8720 | 2.6721 | 3.530(2)   | 168.10 | 1_656   |
| N7  | -- H71  | .. S9  | 0.8717 | 2.6035 | 3.439(2)   | 160.89 | 4_555   |
| N7  | -- H72  | .. S9  | 0.8711 | 2.6017 | 3.462(2)   | 169.66 | .       |
| N8  | -- H81  | .. S1  | 0.8721 | 2.5926 | 3.462(2)   | 174.83 | .       |
| N8  | -- H82  | .. S5  | 0.8703 | 2.7007 | 3.4475(19) | 144.65 | 4_555   |
| N11 | -- H111 | .. S1  | 0.8711 | 2.5436 | 3.364(2)   | 157.33 | 3_655   |
| N11 | -- H112 | .. S1  | 0.8715 | 2.7933 | 3.635(2)   | 162.91 | 1_454   |
| N12 | -- H121 | .. S5  | 0.8727 | 2.7237 | 3.557(2)   | 160.29 | .       |
| N12 | -- H122 | .. S5  | 0.8699 | 2.7563 | 3.4928(19) | 143.31 | 3_655   |

Translation of Symmetry Code to Equiv.Pos for TCO8\_293K

```

a = [ 2_645.00 ] = 1-x, -1/2+y, 1/2-z
b = [ 3_555.00 ] = -x, -y, -z
c = [ 3_555.00 ] = -x, -y, -z
d = [ 4_555.00 ] = x, 1/2-y, 1/2+z
e = [ 1_455.00 ] = -1+x, y, z
f = [ 3_656.00 ] = 1-x, -y, 1-z
g = [ 3_656.00 ] = 1-x, -y, 1-z
h = [ 3_655.00 ] = 1-x, -y, -z
i = [ 1_656.00 ] = 1+x, y, 1+z
l = [ 4_554.00 ] = x, 1/2-y, -1/2+z
m = [ 1_655.00 ] = 1+x, y, z
n = [ 2_655.00 ] = 1-x, 1/2+y, 1/2-z
o = [ 4_655.00 ] = 1+x, 1/2-y, 1/2+z
s = [ 1_454.00 ] = -1+x, y, -1+z
t = [ 4_454.00 ] = -1+x, 1/2-y, -1/2+z

```

Table S7 - Thiourea cyclooctanone at 280 K

Figure S7 - Thiourea cyclooctanone at 280 K. Atom numbering and anisotropic displacement parameter.

Table S7a - Crystal Data and Details of the Structure Determination for TCO8\_280K

Table S7b - Final Coordinates and Equivalent Isotropic Displacement Parameters of the non-Hydrogen atoms for TCO8\_280K

Table S7c - Hydrogen Atom Positions and Isotropic Displacement Parameters for TCO8\_280K

Table S7d - (An)isotropic Displacement Parameters for TCO8\_280K

Table S7e - Bond Distances (Angstrom) for TCO8\_280K

Table S7f - Bond Angles (Degrees) for TCO8\_280K

Table S7g - Torsion Angles (Degrees) for TCO8\_280K

Table S7h - Contact Distances (Angstrom) for TCO8\_280K

Table S7i - Hydrogen Bonds (Angstrom, Deg) for TCO8\_280K

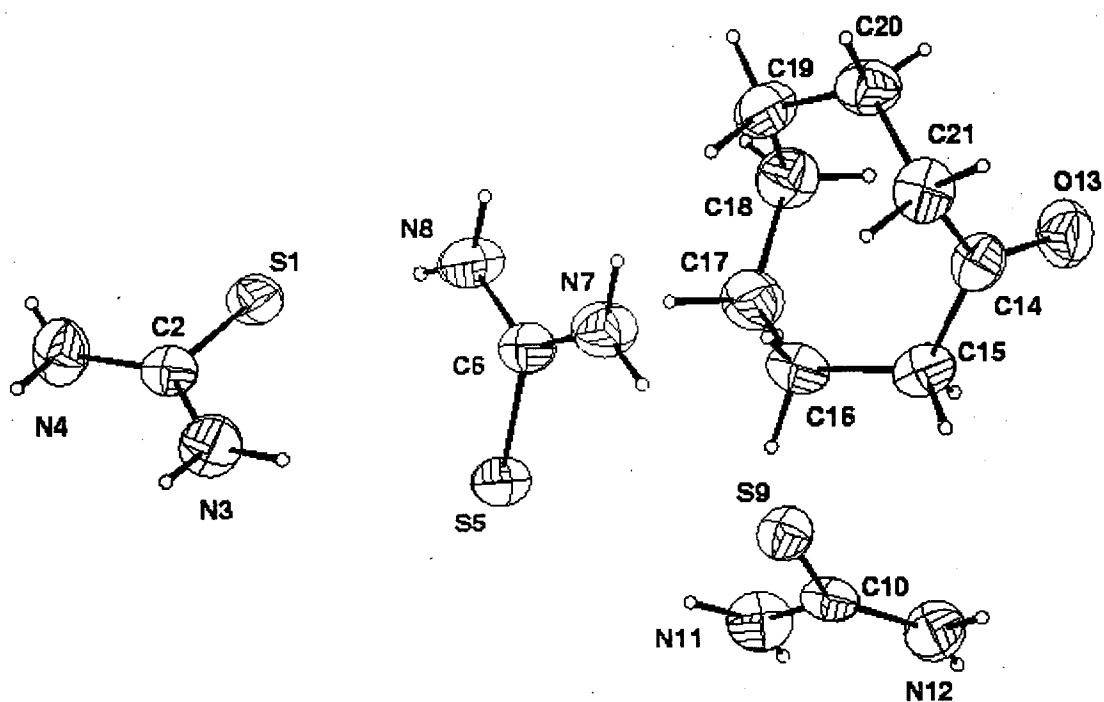


Figure S7 - Thiourea cyclooctanone at 280 K. Atom numbering and anisotropic displacement parameter.

Table S7a Crystal Data and Details of the Structure Determination  
for TCO8\_280K

Crystal Data

|                           |                        |             |             |
|---------------------------|------------------------|-------------|-------------|
| Empirical Formula         | C8 H14 O, 3(C H4 N2 S) |             |             |
| Formula Weight            | 354.59                 |             |             |
| Crystal System            | Monoclinic             |             |             |
| Space group               | P21/c                  | (No. 14)    |             |
| a, b, c [Angstrom]        | 12.219(7)              | 15.6205(17) | 10.3555(14) |
| alpha, beta, gamma [deg]  | 90                     | 111.823(8)  | 90          |
| V [Ang**3]                | 1834.9(11)             |             |             |
| Z                         | 4                      |             |             |
| D(obs), D(calc) [g/cm**3] | 0.000, 1.284           |             |             |
| F(000)                    | 760                    |             |             |
| Mu(CuKa) [ /mm ]          | 3.8                    |             |             |
| Crystal Size [mm]         | 0.16 x 0.19 x 0.80     |             |             |

Data Collection

|                                  |                           |         |       |
|----------------------------------|---------------------------|---------|-------|
| Temperature (K)                  | 280                       |         |       |
| Radiation [Angstrom]             | CuKa                      | 1.54180 |       |
| Theta Min-Max [Deg]              | 2.2, 74.3                 |         |       |
| Scan, (Type & Range) [Deg]       | 0.53 + 0.17 Tan(Theta)    |         |       |
| Dataset                          | -15: 14 ; -19: 1 ; -1: 12 |         |       |
| Tot., Uniq. Data, R(int)         | 4835,                     | 4005,   | 0.040 |
| Observed data [F > 3.0 sigma(I)] | 3636                      |         |       |

Refinement

|                                                                          |                      |      |      |
|--------------------------------------------------------------------------|----------------------|------|------|
| Nref, Npar                                                               | 3636, 191            |      |      |
| R, wR, S                                                                 | 0.0354, 0.0436, 0.90 |      |      |
| w = Chebychev polynomial with 3 parameters<br>Carruthers & Watkin , 1979 | 5.31                 | 3.86 | 3.96 |
| Max. and Av. Shift/Error                                                 | 0.09, 0.00           |      |      |
| Min. and Max. resd. dens. [e/Ang^3]                                      | -0.80, 0.38          |      |      |

Table S7a - Final Coordinates and Equivalent Isotropic Displacement  
Parameters of the non-Hydrogen atoms for TCO8\_280K

| Atom | x           | y            | z            | U(eq) [Ang <sup>2</sup> ] |
|------|-------------|--------------|--------------|---------------------------|
| O13  | 0.04549(9)  | -0.06715(7)  | 0.15947(13)  | 0.0648(3)                 |
| C14  | 0.11643(11) | -0.01743(9)  | 0.14609(13)  | 0.0485(4)                 |
| C15  | 0.19716(13) | -0.04339(11) | 0.07307(14)  | 0.0595(5)                 |
| C16  | 0.32241(13) | -0.00917(12) | 0.13470(15)  | 0.0595(5)                 |
| C17  | 0.39595(13) | -0.04578(12) | 0.27521(17)  | 0.0628(5)                 |
| C18  | 0.34690(13) | -0.03570(10) | 0.38992(14)  | 0.0561(4)                 |
| C19  | 0.31448(13) | 0.05620(10)  | 0.41640(15)  | 0.0589(4)                 |
| C20  | 0.18333(13) | 0.07618(9)   | 0.35853(15)  | 0.0560(4)                 |
| C21  | 0.12292(12) | 0.07256(9)   | 0.20055(15)  | 0.0542(4)                 |
| S1   | 0.85818(3)  | 0.14261(2)   | 0.46981(3)   | 0.0448(1)                 |
| N3   | 0.85589(12) | 0.23519(9)   | 0.25474(13)  | 0.0596(4)                 |
| N4   | 1.01610(10) | 0.25272(8)   | 0.45437(13)  | 0.0565(4)                 |
| C2   | 0.91380(11) | 0.21547(7)   | 0.38705(13)  | 0.0420(3)                 |
| S5   | 0.57056(3)  | 0.15341(2)   | 0.07867(3)   | 0.0468(1)                 |
| N7   | 0.39979(11) | 0.23230(8)   | 0.13048(13)  | 0.0578(4)                 |
| N8   | 0.56773(11) | 0.20788(8)   | 0.31895(12)  | 0.0570(4)                 |
| C6   | 0.50833(11) | 0.20127(7)   | 0.18343(13)  | 0.0433(4)                 |
| S9   | 0.21441(3)  | 0.19740(2)   | -0.21056(3)  | 0.0465(1)                 |
| N11  | 0.33338(11) | 0.05356(8)   | -0.19165(13) | 0.0563(4)                 |
| N12  | 0.13578(11) | 0.04566(8)   | -0.31523(14) | 0.0588(4)                 |
| C10  | 0.22845(11) | 0.09111(8)   | -0.24108(12) | 0.0420(3)                 |

U(eq) = 1/3 of the trace of the orthogonalized U Tensor

Table S7b - Hydrogen Atom Positions and Isotropic Displacement Parameters for TCO8\_280K

| Atom | x           | y            | z            | U(iso) [Ang^2] |
|------|-------------|--------------|--------------|----------------|
| H151 | 0.20162(13) | -0.10733(11) | 0.07444(14)  | 0.0695         |
| H152 | 0.16135(13) | -0.02301(11) | -0.02535(14) | 0.0695         |
| H161 | 0.36249(13) | -0.02255(12) | 0.06867(15)  | 0.0736         |
| H162 | 0.31835(13) | 0.05430(12)  | 0.14466(15)  | 0.0736         |
| H171 | 0.47477(13) | -0.01716(12) | 0.30728(17)  | 0.0748         |
| H172 | 0.40577(13) | -0.10841(12) | 0.26261(17)  | 0.0748         |
| H181 | 0.40753(13) | -0.05760(10) | 0.47839(14)  | 0.0645         |
| H182 | 0.27407(13) | -0.07150(10) | 0.36461(14)  | 0.0645         |
| H191 | 0.34508(13) | 0.06590(10)  | 0.51920(15)  | 0.0682         |
| H192 | 0.35407(13) | 0.09670(10)  | 0.37278(15)  | 0.0682         |
| H201 | 0.17240(13) | 0.13515(9)   | 0.38936(15)  | 0.0682         |
| H202 | 0.14351(13) | 0.03380(9)   | 0.39881(15)  | 0.0682         |
| H211 | 0.16840(12) | 0.10871(9)   | 0.15830(15)  | 0.0626         |
| H212 | 0.04106(12) | 0.09562(9)   | 0.17330(15)  | 0.0626         |
| H31  | 0.88500     | 0.27250      | 0.21360      | 0.0689         |
| H32  | 0.78830     | 0.21100      | 0.20800      | 0.0689         |
| H41  | 1.04440     | 0.28980      | 0.41200      | 0.0657         |
| H42  | 1.05610     | 0.24030      | 0.54130      | 0.0657         |
| H71  | 0.36880     | 0.25660      | 0.18460      | 0.0701         |
| H72  | 0.35910     | 0.22860      | 0.04160      | 0.0701         |
| H81  | 0.63920     | 0.18770      | 0.35580      | 0.0672         |
| H82  | 0.53560     | 0.23230      | 0.37170      | 0.0672         |
| H111 | 0.39600     | 0.08310      | -0.14330     | 0.0671         |
| H112 | 0.34040     | -0.00050     | -0.20740     | 0.0671         |
| H121 | 0.14340     | -0.00850     | -0.33040     | 0.0708         |
| H122 | 0.06640     | 0.06950      | -0.34910     | 0.0708         |

The temperature factor has the form of  $\text{EXP}(-T)$  where  $T = 8\pi^2 U \sin^2(\theta/\lambda)$  for isotropic Atoms

Table S7c - (An)isotropic Displacement Parameters for TCO8\_280K

| Atom | U(1,1) or U | U(2,2)    | U(3,3)    | U(2,3)     | U(1,3)    | U(1,2)     |
|------|-------------|-----------|-----------|------------|-----------|------------|
| O13  | 0.0582(5)   | 0.0567(6) | 0.0798(7) | -0.0089(5) | 0.0261(5) | -0.0113(5) |

|     |           |            |           |            |           |            |
|-----|-----------|------------|-----------|------------|-----------|------------|
| C14 | 0.0469(6) | 0.0481(7)  | 0.0446(6) | 0.0005(5)  | 0.0101(5) | -0.0007(5) |
| C15 | 0.0632(8) | 0.0691(9)  | 0.0449(7) | -0.0104(6) | 0.0186(6) | -0.0030(7) |
| C16 | 0.0614(8) | 0.0750(10) | 0.0513(7) | -0.0032(7) | 0.0316(6) | -0.0023(7) |
| C17 | 0.0519(7) | 0.0760(10) | 0.0613(8) | -0.0041(7) | 0.0219(6) | 0.0080(7)  |
| C18 | 0.0554(7) | 0.0627(8)  | 0.0448(7) | 0.0091(6)  | 0.0124(6) | 0.0080(6)  |
| C19 | 0.0659(8) | 0.0632(8)  | 0.0448(7) | -0.0099(6) | 0.0175(6) | -0.0057(7) |
| C20 | 0.0700(8) | 0.0458(7)  | 0.0578(8) | -0.0064(6) | 0.0302(7) | 0.0030(6)  |
| C21 | 0.0558(7) | 0.0426(7)  | 0.0608(8) | 0.0039(6)  | 0.0178(6) | 0.0062(5)  |
| S1  | 0.0566(2) | 0.0409(2)  | 0.0393(2) | 0.0022(1)  | 0.0205(1) | -0.0062(1) |
| N3  | 0.0696(7) | 0.0617(7)  | 0.0449(6) | 0.0124(5)  | 0.0182(5) | -0.0114(6) |
| N4  | 0.0582(6) | 0.0504(6)  | 0.0571(7) | 0.0105(5)  | 0.0169(5) | -0.0107(5) |
| C2  | 0.0515(6) | 0.0337(5)  | 0.0438(6) | 0.0013(4)  | 0.0211(5) | 0.0019(5)  |
| S5  | 0.0520(2) | 0.0506(2)  | 0.0391(2) | -0.0024(1) | 0.0186(1) | 0.0055(1)  |
| N7  | 0.0600(7) | 0.0606(7)  | 0.0554(6) | -0.0050(5) | 0.0246(5) | 0.0107(5)  |
| N8  | 0.0652(7) | 0.0652(7)  | 0.0419(6) | -0.0058(5) | 0.0214(5) | 0.0065(6)  |
| C6  | 0.0550(7) | 0.0348(6)  | 0.0436(6) | -0.0004(5) | 0.0223(5) | -0.0016(5) |
| S9  | 0.0489(2) | 0.0377(2)  | 0.0514(2) | -0.0033(1) | 0.0169(2) | 0.0026(1)  |
| N11 | 0.0618(7) | 0.0456(6)  | 0.0613(7) | 0.0031(5)  | 0.0228(5) | 0.0118(5)  |
| N12 | 0.0629(7) | 0.0455(6)  | 0.0713(8) | -0.0157(5) | 0.0288(6) | -0.0044(5) |
| C10 | 0.0548(6) | 0.0400(6)  | 0.0394(6) | 0.0019(4)  | 0.0269(5) | 0.0027(5)  |

=====

The temperature factor has the form of  $\text{EXP}(-T)$  where

$$T = 8\pi^2 U \sin^2(\theta/\lambda) \text{ for isotropic atoms}$$

$$T = \sum_{ij} h_i h_j U_{ij} a_i^* a_j^* \text{ for anisotropic atoms.}$$

$a_i^*$  are reciprocal axial lengths and  $h_i$  are the reflection indices.

Table S7d - Bond Distances (Angstrom) for TCO8\_280K

|     |      |            |     |      |            |
|-----|------|------------|-----|------|------------|
| S1  | -C2  | 1.7102(16) | S5  | -C6  | 1.7109(17) |
| S9  | -C10 | 1.7106(16) | N3  | -C2  | 1.3236(19) |
| N4  | -C2  | 1.319(2)   | C19 | -C20 | 1.520(2)   |
| N7  | -C6  | 1.324(2)   | N8  | -C6  | 1.3227(19) |
| N11 | -C10 | 1.327(2)   | N12 | -C10 | 1.315(2)   |
| O13 | -C14 | 1.210(2)   | C14 | -C15 | 1.505(2)   |
| C14 | -C21 | 1.506(2)   | C15 | -C16 | 1.520(3)   |
| C16 | -C17 | 1.510(2)   | C17 | -C18 | 1.525(2)   |
| C18 | -C19 | 1.541(2)   | C20 | -C21 | 1.525(2)   |

Table S7e - Bond Angles (Degrees) for TCO8\_280K

|     |      |      |            |     |      |      |            |
|-----|------|------|------------|-----|------|------|------------|
| S1  | -C2  | -N3  | 120.96(11) | S1  | -C2  | -N4  | 120.26(10) |
| S5  | -C6  | -N8  | 120.59(11) | N7  | -C6  | -N8  | 118.74(13) |
| S5  | -C6  | -N7  | 120.67(10) | N11 | -C10 | -N12 | 119.03(12) |
| S9  | -C10 | -N11 | 120.43(10) | N3  | -C2  | -N4  | 118.78(13) |
| S9  | -C10 | -N12 | 120.54(11) | O13 | -C14 | -C21 | 119.79(13) |
| C15 | -C14 | -C21 | 119.13(13) | O13 | -C14 | -C15 | 121.07(13) |
| C14 | -C15 | -C16 | 116.12(12) | C15 | -C16 | -C17 | 114.66(14) |
| C16 | -C17 | -C18 | 116.50(14) | C17 | -C18 | -C19 | 115.88(13) |
| C18 | -C19 | -C20 | 115.11(13) | C19 | -C20 | -C21 | 115.73(13) |
| C14 | -C21 | -C20 | 111.93(11) |     |      |      |            |

Table S7f - Torsion Angles (Degrees) for TCO8\_280K

|     |      |      |      |            |     |      |      |      |             |
|-----|------|------|------|------------|-----|------|------|------|-------------|
| O13 | -C14 | -C21 | -C20 | 75.40(18)  | O13 | -C14 | -C15 | -C16 | -141.67(15) |
| C21 | -C14 | -C15 | -C16 | 39.57(19)  | C15 | -C14 | -C21 | -C20 | -105.82(15) |
| C14 | -C15 | -C16 | -C17 | 68.47(19)  | C15 | -C16 | -C17 | -C18 | -56.5(2)    |
| C16 | -C17 | -C18 | -C19 | -53.7(2)   | C17 | -C18 | -C19 | -C20 | 103.56(16)  |
| C18 | -C19 | -C20 | -C21 | -64.15(17) | C19 | -C20 | -C21 | -C14 | 68.58(17)   |

Table S7g - Contact Distances (Angstrom) for TCO8\_280K

|    |        |          |     |        |          |
|----|--------|----------|-----|--------|----------|
| S1 | .N8    | 3.457(2) | O13 | .C14_c | 3.319(3) |
| S1 | .N3_k  | 3.523(2) | O13 | .N4_a  | 3.035(2) |
| S1 | .N12_j | 3.362(2) | S5  | .N11_j | 3.490(2) |

|     |        |          |     |        |          |
|-----|--------|----------|-----|--------|----------|
| S5  | .N3    | 3.519(3) | S5  | .N8_q  | 3.444(2) |
| S9  | .N7    | 3.457(2) | S9  | .N7_q  | 3.438(2) |
| S9  | .N4_s  | 3.522(2) | N3  | .S5    | 3.519(3) |
| S9  | .N4_t  | 3.532(2) | N3  | .S1_l  | 3.523(2) |
| S9  | .C20_u | 3.656(3) | N4  | .O13_n | 3.035(2) |
| N4  | .S9_i  | 3.522(2) | N4  | .S9_o  | 3.532(2) |
| N7  | .S9    | 3.457(2) | N7  | .S9_d  | 3.438(2) |
| N8  | .S1    | 3.457(2) | N8  | .S5_r  | 3.444(2) |
| N11 | .S5_e  | 3.490(2) | N12 | .S1_v  | 3.362(2) |
| N12 | .O13_c | 3.206(3) | C14 | .O13_c | 3.319(3) |
| C14 | .C14_c | 3.339(3) | C14 | .C18   | 3.017(3) |
| C18 | .C14   | 3.017(3) | C20 | .S9_d  | 3.656(3) |
| O13 | .N12_b | 3.206(3) |     |        |          |

Table S7h - Hydrogen Bonds (Angstrom, Deg) for TC08\_280K

|     |               |          |          |          |            |       |
|-----|---------------|----------|----------|----------|------------|-------|
| N3  | -- H31 .. S1  | 0.8720   | 2.7612   | 3.523(2) | 146.76     | 4_554 |
| N3  | -- H32 .. S5  | 0.8729   | 2.6519   | 3.519(3) | 172.62     | .     |
| N4  | -- H41 .. O13 | 0.8720   | 2.4785   | 3.035(2) | 122.31     | 2_655 |
| N4  | -- H41 .. S9  | 0.8720   | 2.8154   | 3.532(2) | 140.45     | 4_655 |
| N4  | -- H42 .. S9  | 0.8716   | 2.6643   | 3.522(2) | 168.35     | 1_656 |
| N7  | -- H71 .. S9  | 0.8714   | 2.6032   | 3.438(2) | 160.74     | 4_555 |
| N7  | -- H72 .. S9  | 0.8703   | 2.5980   | 3.457(2) | 169.48     | .     |
| N8  | -- H81 .. S1  | 0.8717   | 2.5886   | 3.457(2) | 174.58     | .     |
| N8  | -- H82 .. S5  | 0.8703   | 2.6986   | 3.444(2) | 144.42     | 4_555 |
| N11 | -- H111 .. S5 | 0.8742   | 2.7192   | 3.555(2) | 160.36     | .     |
| N11 | -- H112 .. S5 | 0.8703   | 2.7545   | 3.490(2) | 143.07     | 3_655 |
| N12 | -- H121 .. S1 | 0.8718   | 2.5401   | 3.362(2) | 157.52     | 3_655 |
| N12 | -- H122 .. S1 | 0.8714   | 2.7833   | 3.625(3) | 162.83     | 1_454 |
| C16 | -- H161 .. S5 | 1.000(2) | 2.847(2) | 3.717(3) | 145.89(17) | 3_655 |

Translation of Symmetry Code to Equiv.Pos

a = [ 2\_645.00 ] = 1-x, -1/2+y, 1/2-z  
 b = [ 3\_555.00 ] = -x, -y, -z  
 c = [ -3\_555.00 ] = -x, -y, -z  
 d = [ 4\_555.00 ] = x, 1/2-y, 1/2+z  
 e = [ 3\_655.00 ] = 1-x, -y, -z

$f = [ 3\_656.00 ] = 1-x, -y, 1-z$   
 $g = [ 3\_656.00 ] = 1-x, -y, 1-z$   
 $h = [ 1\_455.00 ] = -1+x, y, z$   
 $i = [ 1\_656.00 ] = 1+x, y, 1+z$   
 $l = [ 4\_554.00 ] = x, 1/2-y, -1/2+z$   
 $m = [ 1\_655.00 ] = 1+x, y, z$   
 $n = [ 2\_655.00 ] = 1-x, 1/2+y, 1/2-z$   
 $o = [ 4\_655.00 ] = 1+x, 1/2-y, 1/2+z$   
 $s = [ 1\_454.00 ] = -1+x, y, -1+z$   
 $t = [ 4\_454.00 ] = -1+x, 1/2-y, -1/2+z$

Table S8 - Thiourea cyclooctanone at 120 K

Figure S8 - Thiourea cyclooctanone at 120 K. Atom numbering and anisotropic displacement parameter.

Table S8a - Crystal Data and Details of the Structure Determination for TCO8\_120K

Table S8b - Final Coordinates and Equivalent Isotropic Displacement Parameters of the non-Hydrogen atoms for TCO8\_120K

Table S8c - Hydrogen Atom Positions and Isotropic Displacement Parameters for TCO8\_120K

Table S8d - (An)isotropic Displacement Parameters for TCO8\_120K

Table S8e - Bond Distances (Angstrom) for TCO8\_120K

Table S8f - Bond Angles (Degrees) for TCO8\_120K

Table S8g - Torsion Angles (Degrees) for TCO8\_120K

Table S8h - Contact Distances (Angstrom) for TCO8\_120K

Table S8i - Hydrogen Bonds (Angstrom, Deg) for TCO8\_120K

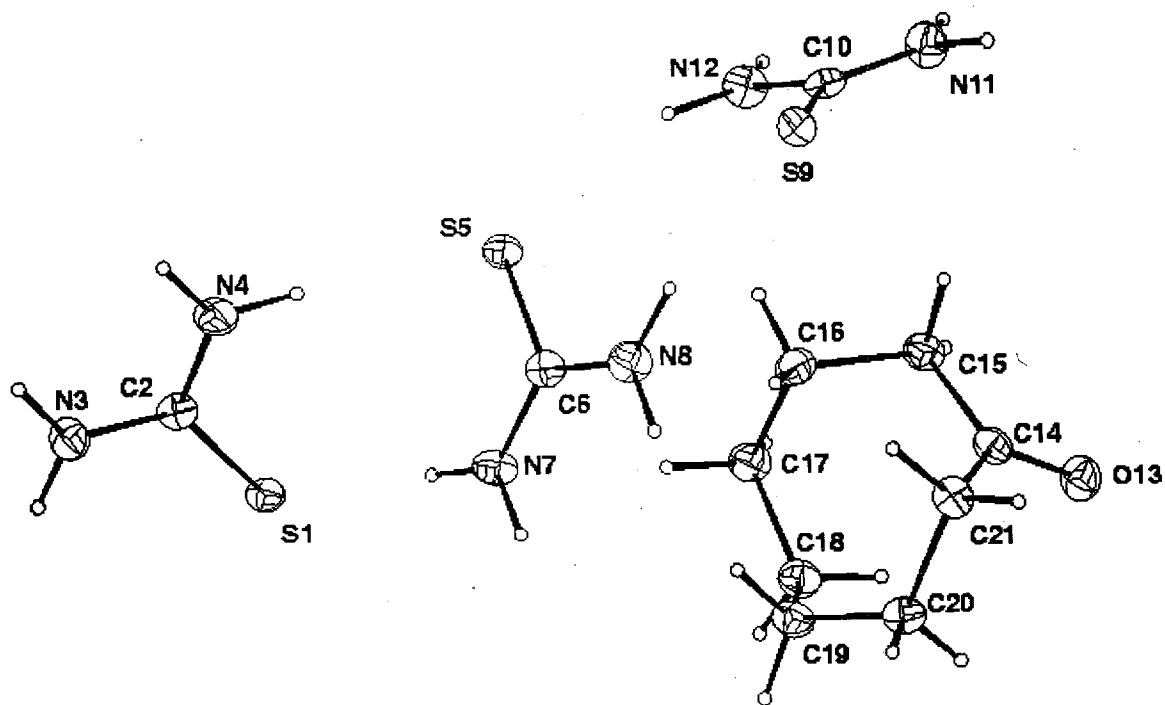


Figure S8 - Thiourea cyclooctanone at 120 K. Atom numbering and anisotropic displacement parameter.

Table S8a - Crystal Data and Details of the Structure Determination  
for TCO8\_120K

## Crystal Data

|                           |                        |             |             |
|---------------------------|------------------------|-------------|-------------|
| Empirical Formula         | C8 H14 O, 3(C H4 N2 S) |             |             |
| Formula Weight            | 354.59                 |             |             |
| Crystal System            | Monoclinic             |             |             |
| Space group               | P21/c                  | (No. 14)    |             |
| a, b, c [Angstrom]        | 12.0830(14)            | 15.518(2)   | 10.2930(14) |
| alpha, beta, gamma [deg]  | 90                     | 111.770(10) | 90          |
| V [Ang**3]                | 1792.3(4)              |             |             |
| Z                         | 4                      |             |             |
| D(obs), D(calc) [g/cm**3] | 0.000, 1.314           |             |             |
| F(000)                    | 760                    |             |             |
| Mu(CuKa) [ /mm ]          | 3.9                    |             |             |
| Crystal Size [mm]         | 0.16 x 0.19 x 0.80     |             |             |

## Data Collection

|                                  |                           |       |         |
|----------------------------------|---------------------------|-------|---------|
| Temperature (K)                  |                           |       | 120     |
| Radiation [Angstrom]             | CuKa                      |       | 1.54180 |
| Theta Min-Max [Deg]              |                           | 2.2,  | 74.3    |
| Scan, (Type & Range) [Deg]       | 0.43 + 0.15 Tan(Theta)    |       |         |
| Dataset                          | -15: 14 ; -19: 1 ; -1: 12 |       |         |
| Tot., Uniq. Data, R(int)         | 4718,                     | 3901, | 0.050   |
| Observed data [F > 3.0 sigma(I)] |                           |       | 3798    |

## Refinement

|                                                                          |                      |      |      |
|--------------------------------------------------------------------------|----------------------|------|------|
| Nref, Npar                                                               | 3798, 191            |      |      |
| R, wR, S                                                                 | 0.0380, 0.0434, 1.07 |      |      |
| w = Chebychev polynomial with 3 parameters<br>Carruthers & Watkin , 1979 | 4.11                 | 1.56 | 2.72 |
| Max. and Av. Shift/Error                                                 | 0.67, 0.00           |      |      |
| Min. and Max. resd. dens. [e/Ang^3]                                      | -0.42, 0.42          |      |      |

Table S8b - Final Coordinates and Equivalent Isotropic Displacement  
Parameters of the non-Hydrogen atoms for TCO8\_120K

| Atom | x            | y           | z           | U(eq) [Ang <sup>2</sup> ] |
|------|--------------|-------------|-------------|---------------------------|
| ---- | ---          | ---         | ---         | -----                     |
| O13  | 0.45573(8)   | 0.06828(6)  | 0.34330(10) | 0.0276(3)                 |
| C14  | 0.38383(11)  | 0.01783(8)  | 0.35763(12) | 0.0211(3)                 |
| C15  | 0.30124(12)  | 0.04371(9)  | 0.43103(13) | 0.0246(3)                 |
| C16  | 0.17468(11)  | 0.00746(9)  | 0.36781(13) | 0.0241(4)                 |
| C17  | 0.09947(12)  | 0.04435(9)  | 0.22495(14) | 0.0264(4)                 |
| C18  | 0.15152(11)  | 0.03486(9)  | 0.11061(13) | 0.0239(3)                 |
| C19  | 0.18500(12)  | -0.05782(9) | 0.08465(14) | 0.0248(3)                 |
| C20  | 0.31832(11)  | -0.07715(8) | 0.14309(13) | 0.0234(3)                 |
| C21  | 0.37877(11)  | -0.07365(8) | 0.30357(13) | 0.0223(3)                 |
| S1   | -0.35535(3)  | -0.14084(2) | 0.02520(3)  | 0.0195(1)                 |
| N3   | -0.51510(10) | -0.25351(7) | 0.03903(12) | 0.0254(3)                 |
| N4   | -0.35286(11) | -0.23630(8) | 0.24143(12) | 0.0273(3)                 |
| C2   | -0.41165(11) | -0.21543(8) | 0.10765(13) | 0.0195(3)                 |
| S5   | -0.06964(3)  | -0.15255(2) | 0.41925(3)  | 0.0204(1)                 |
| N7   | -0.06670(10) | -0.20747(8) | 0.17626(11) | 0.0262(3)                 |
| N8   | 0.10320(10)  | -0.23339(7) | 0.36718(12) | 0.0257(3)                 |
| C6   | -0.00664(12) | -0.20127(8) | 0.31330(13) | 0.0203(3)                 |
| S9   | 0.28889(3)   | -0.19831(2) | 0.70665(3)  | 0.0203(1)                 |
| N11  | 0.36710(10)  | -0.04555(7) | 0.81761(12) | 0.0264(3)                 |
| N12  | 0.16630(10)  | -0.05393(7) | 0.69218(12) | 0.0250(3)                 |
| C10  | 0.27341(11)  | -0.09163(8) | 0.74089(12) | 0.0193(3)                 |

U(eq) = 1/3 of the trace of the orthogonalized U Tensor

Table S8c - Hydrogen Atom Positions and Isotropic Displacement Parameters for TCO8\_120K

| Atom | x           | y           | z            | U(iso) [Ang^2] |
|------|-------------|-------------|--------------|----------------|
| H151 | 0.33730(12) | 0.02460(9)  | 0.53023(13)  | 0.0600         |
| H152 | 0.29475(12) | 0.10830(9)  | 0.42747(13)  | 0.0600         |
| H161 | 0.13292(11) | 0.01914(9)  | 0.43401(13)  | 0.0600         |
| H162 | 0.18065(11) | -0.05627(9) | 0.35715(13)  | 0.0600         |
| H171 | 0.08791(12) | 0.10742(9)  | 0.23740(14)  | 0.0600         |
| H172 | 0.02027(12) | 0.01492(9)  | 0.19117(14)  | 0.0600         |
| H181 | 0.22613(11) | 0.07072(9)  | 0.13868(13)  | 0.0600         |
| H182 | 0.09241(11) | 0.05792(9)  | 0.02094(13)  | 0.0600         |
| H191 | 0.14536(12) | -0.09844(9) | 0.12959(14)  | 0.0600         |
| H192 | 0.15284(12) | -0.06839(9) | -0.01897(14) | 0.0600         |
| H201 | 0.33060(11) | -0.13632(8) | 0.11078(13)  | 0.0600         |
| H202 | 0.35819(11) | -0.03386(8) | 0.10276(13)  | 0.0600         |
| H211 | 0.46223(11) | -0.09663(8) | 0.33330(13)  | 0.0600         |
| H212 | 0.33274(11) | -0.11044(8) | 0.34626(13)  | 0.0600         |
| H31  | -0.54780    | -0.29730    | 0.08710      | 0.0600         |
| H32  | -0.56210    | -0.23820    | -0.06100     | 0.0600         |
| H41  | -0.38700    | -0.28020    | 0.28740      | 0.0600         |
| H42  | -0.27540    | -0.20780    | 0.29630      | 0.0600         |
| H71  | -0.02940    | -0.23630    | 0.11530      | 0.0600         |
| H72  | -0.14910    | -0.18350    | 0.13360      | 0.0600         |
| H81  | 0.15030     | -0.22880    | 0.46990      | 0.0600         |
| H82  | 0.13940     | -0.26180    | 0.30480      | 0.0600         |
| H111 | 0.44780     | -0.07310    | 0.85690      | 0.0600         |
| H112 | 0.35770     | 0.01660     | 0.83770      | 0.0600         |
| H121 | 0.15810     | 0.00840     | 0.71280      | 0.0600         |
| H122 | 0.09420     | -0.08780    | 0.63550      | 0.0600         |

=====

The temperature factor has the form of  $\text{EXP}(-T)$  where  $T = 8\pi^2 U \sin^2(\theta/\lambda)$  for isotropic Atoms

Table S8d - (An)isotropic Displacement Parameters for TCO8\_120K

| Atom | U(1,1) or U | U(2,2)    | U(3,3)    | U(2,3)     | U(1,3)    | U(1,2)     |
|------|-------------|-----------|-----------|------------|-----------|------------|
| O13  | 0.0285(5)   | 0.0219(5) | 0.0329(5) | -0.0031(4) | 0.0118(4) | -0.0055(4) |

|     |           |           |           |            |           |            |
|-----|-----------|-----------|-----------|------------|-----------|------------|
| C14 | 0.0226(6) | 0.0193(6) | 0.0186(6) | 0.0008(5)  | 0.0044(5) | 0.0008(5)  |
| C15 | 0.0279(6) | 0.0255(6) | 0.0203(6) | -0.0041(5) | 0.0088(5) | -0.0019(5) |
| C16 | 0.0263(6) | 0.0262(7) | 0.0227(6) | -0.0005(5) | 0.0126(5) | -0.0011(5) |
| C17 | 0.0248(6) | 0.0295(7) | 0.0247(6) | -0.0010(5) | 0.0089(5) | 0.0039(5)  |
| C18 | 0.0262(6) | 0.0239(6) | 0.0202(6) | 0.0032(5)  | 0.0070(5) | 0.0033(5)  |
| C19 | 0.0290(6) | 0.0229(6) | 0.0215(6) | -0.0026(5) | 0.0082(5) | -0.0019(5) |
| C20 | 0.0296(6) | 0.0181(6) | 0.0239(6) | -0.0013(5) | 0.0116(5) | 0.0010(5)  |
| C21 | 0.0246(6) | 0.0158(6) | 0.0248(6) | 0.0015(5)  | 0.0073(5) | 0.0016(5)  |
| S1  | 0.0256(2) | 0.0154(2) | 0.0183(2) | 0.0010(1)  | 0.0090(1) | -0.0026(1) |
| N3  | 0.0271(5) | 0.0212(5) | 0.0256(5) | 0.0033(4)  | 0.0071(4) | -0.0047(4) |
| N4  | 0.0331(6) | 0.0263(6) | 0.0212(5) | 0.0053(4)  | 0.0086(4) | -0.0055(5) |
| C2  | 0.0255(6) | 0.0133(5) | 0.0214(6) | -0.0003(4) | 0.0105(5) | 0.0011(5)  |
| S5  | 0.0240(2) | 0.0192(2) | 0.0183(2) | -0.0010(1) | 0.0082(1) | 0.0020(1)  |
| N7  | 0.0312(6) | 0.0269(6) | 0.0208(5) | -0.0023(4) | 0.0101(4) | 0.0028(5)  |
| N8  | 0.0275(5) | 0.0236(6) | 0.0266(5) | -0.0023(4) | 0.0109(4) | 0.0048(4)  |
| C6  | 0.0272(6) | 0.0129(5) | 0.0222(6) | -0.0001(4) | 0.0108(5) | -0.0019(4) |
| S9  | 0.0230(2) | 0.0144(2) | 0.0226(2) | -0.0014(1) | 0.0075(1) | 0.0011(1)  |
| N11 | 0.0283(6) | 0.0194(5) | 0.0318(6) | -0.0059(5) | 0.0115(5) | -0.0018(4) |
| N12 | 0.0279(5) | 0.0195(5) | 0.0269(6) | 0.0014(4)  | 0.0093(4) | 0.0056(4)  |
| C10 | 0.0268(6) | 0.0169(6) | 0.0182(5) | 0.0014(4)  | 0.0130(5) | 0.0014(5)  |

=====

The temperature factor has the form of  $\text{EXP}(-T)$  where

$$T = 8\pi^2 U \sin^2(\theta/\lambda) \text{ for isotropic atoms}$$

$$T = \sum_{ij} h_i h_j U_{ij} a_i^* a_j^* \text{ for anisotropic atoms.}$$

$a_i^*$  are reciprocal axial lengths and  $h_i$  are the reflection indices.

Table S8e - Bond Distances (Angstrom) for TCO8\_120K

|     |      |            |     |      |            |
|-----|------|------------|-----|------|------------|
| S1  | -C2  | 1.7178(14) | S5  | -C6  | 1.7193(14) |
| S9  | -C10 | 1.7171(13) | N3  | -C2  | 1.3250(18) |
| N4  | -C2  | 1.3342(17) | N7  | -C6  | 1.3290(16) |
| N8  | -C6  | 1.3310(19) | N11 | -C10 | 1.3241(18) |
| N12 | -C10 | 1.3369(18) | O13 | -C14 | 1.2184(17) |
| C14 | -C15 | 1.512(2)   | C15 | -C16 | 1.530(2)   |
| C16 | -C17 | 1.5247(19) | C17 | -C18 | 1.533(2)   |
| C18 | -C19 | 1.544(2)   | C19 | -C20 | 1.526(2)   |
| C20 | -C21 | 1.5395(18) | C14 | -C21 | 1.5177(18) |

Table S8f - Bond Angles (Degrees) for TCO8\_120K

|     |      |      |            |     |      |      |            |
|-----|------|------|------------|-----|------|------|------------|
| S1  | -C2  | -N3  | 120.35(10) | S1  | -C2  | -N4  | 121.11(11) |
| S5  | -C6  | -N8  | 120.53(10) | N7  | -C6  | -N8  | 118.86(13) |
| S5  | -C6  | -N7  | 120.60(11) | N11 | -C10 | -N12 | 118.81(12) |
| S9  | -C10 | -N11 | 120.59(10) | N3  | -C2  | -N4  | 118.54(12) |
| S9  | -C10 | -N12 | 120.59(10) | C15 | -C14 | -C21 | 119.16(12) |
| O13 | -C14 | -C21 | 119.35(12) | O13 | -C14 | -C15 | 121.47(12) |
| C14 | -C15 | -C16 | 115.50(11) | C15 | -C16 | -C17 | 114.61(11) |
| C16 | -C17 | -C18 | 115.90(12) | C17 | -C18 | -C19 | 115.51(11) |
| C18 | -C19 | -C20 | 114.90(11) | C19 | -C20 | -C21 | 115.31(11) |
| C14 | -C21 | -C20 | 111.40(10) |     |      |      |            |

Table S8g - Torsion Angles (Degrees) for TCO8\_120K

|     |      |      |      |            |     |      |      |      |             |
|-----|------|------|------|------------|-----|------|------|------|-------------|
| O13 | -C14 | -C21 | -C20 | -74.98(15) | O13 | -C14 | -C15 | -C16 | 141.83(13)  |
| C21 | -C14 | -C15 | -C16 | -39.56(16) | C15 | -C14 | -C21 | -C20 | 106.37(13)  |
| C14 | -C15 | -C16 | -C17 | -69.03(15) | C15 | -C16 | -C17 | -C18 | 56.63(16)   |
| C16 | -C17 | -C18 | -C19 | 54.48(16)  | C17 | -C18 | -C19 | -C20 | -104.76(14) |
| C18 | -C19 | -C20 | -C21 | 64.89(15)  | C19 | -C20 | -C21 | -C14 | -68.95(15)  |

Table S8h - Contact Distances (Angstrom) for TCO8\_120K

|    |        |            |     |        |            |
|----|--------|------------|-----|--------|------------|
| S1 | .N7    | 3.4101(14) | S1  | .N4_k  | 3.4974(13) |
| S1 | .N11_j | 3.3428(12) | O13 | .N3_a  | 2.9975(15) |
| S1 | .C18_e | 3.6440(15) | O13 | .C14_c | 3.2547(16) |

|     |        |            |     |        |            |
|-----|--------|------------|-----|--------|------------|
| S5  | .C16_p | 3.6807(15) | O13 | .N11_b | 3.1750(17) |
| S5  | .N4    | 3.4791(15) | S5  | .N7_q  | 3.4129(13) |
| S5  | .N12_j | 3.4572(12) | S5  | .N12   | 3.5243(13) |
| S9  | .N8_q  | 3.4114(14) | S9  | .N8    | 3.4241(13) |
| S9  | .C20_u | 3.5872(14) | N3  | .S9_i  | 3.4695(13) |
| S9  | .N3_t  | 3.4894(14) | N3  | .S9_n  | 3.4894(14) |
| S9  | .N3_s  | 3.4695(13) | N3  | .O13_m | 2.9975(15) |
| N4  | .S1_o  | 3.4975(13) | N4  | .S5    | 3.4791(15) |
| N7  | .S1    | 3.4101(14) | N7  | .S5_r  | 3.4129(13) |
| N8  | .S9    | 3.4241(13) | N8  | .S9_g  | 3.4114(14) |
| N11 | .S1_v  | 3.3428(12) | N11 | .O13_c | 3.1750(17) |
| N12 | .S5    | 3.5243(13) | N12 | .S5_d  | 3.4572(12) |
| C14 | .O13_c | 3.2547(16) | C14 | .C18   | 3.0199(19) |
| C14 | .C14_c | 3.2671(18) | C16 | .S5_d  | 3.6807(15) |
| C18 | .S1_f  | 3.6439(15) | C18 | .C14   | 3.0199(19) |
| C20 | .S9_g  | 3.5872(14) |     |        |            |

Table S8i - Hydrogen Bonds (Angstrom, Deg) for TCO8\_120K

| D   | H       | A      | D - H      | H -- A     | D --- A    | D H A      | Symm(A) |
|-----|---------|--------|------------|------------|------------|------------|---------|
| N3  | -- H31  | .. O13 | 1.0038     | 2.3475     | 2.9975(15) | 121.55     | 2_545   |
| N3  | -- H31  | .. S9  | 1.0038     | 2.6858     | 3.4894(14) | 137.17     | 4_444   |
| N3  | -- H32  | .. S9  | 1.0027     | 2.4800     | 3.4695(13) | 168.97     | 1_454   |
| N4  | -- H41  | .. S1  | 1.0015     | 2.6352     | 3.4975(13) | 144.28     | 4_545   |
| N4  | -- H42  | .. S5  | 0.9992     | 2.4868     | 3.4791(15) | 172.02     | .       |
| N7  | -- H71  | .. S5  | 1.0034     | 2.5604     | 3.4129(13) | 142.67     | 4_544   |
| N7  | -- H72  | .. S1  | 0.9991     | 2.4148     | 3.4101(14) | 174.04     | .       |
| N8  | -- H81  | .. S9  | 1.0003     | 2.4371     | 3.4241(13) | 168.91     | .       |
| N8  | -- H82  | .. S9  | 1.0031     | 2.4536     | 3.4114(14) | 159.52     | 4_544   |
| N11 | -- H111 | .. S1  | 1.0023     | 2.5898     | 3.5614(14) | 163.28     | 1_656   |
| N11 | -- H112 | .. S1  | 1.0016     | 2.3956     | 3.3428(12) | 157.45     | 3_556   |
| N12 | -- H121 | .. S5  | 1.0030     | 2.6298     | 3.4572(12) | 139.82     | 3_556   |
| N12 | -- H122 | .. S5  | 0.9993     | 2.5719     | 3.5243(13) | 159.28     | .       |
| C16 | -- H161 | .. S5  | 1.0034(19) | 2.8299(15) | 3.6807(15) | 142.95(13) | 3_556   |
| C20 | -- H201 | .. S9  | 1.0061(18) | 2.8604(14) | 3.5872(14) | 129.66(12) | 4_544   |

Translation of Symmetry Code to Equiv.Pos for TCO8\_120K

|                  |                     |                  |                        |
|------------------|---------------------|------------------|------------------------|
| a = [ 2_555.00 ] | = -x, 1/2+y, 1/2-z  | i = [ 1_454.00 ] | = -1+x, y, -1+z        |
| b = [ 3_656.00 ] | = 1-x, -y, 1-z      | l = [ 1_455.00 ] | = -1+x, y, z           |
| c = [ 3_656.00 ] | = 1-x, -y, 1-z      | m = [ 2_545.00 ] | = -x, -1/2+y, 1/2-z    |
| d = [ 3_556.00 ] | = -x, -y, 1-z       | n = [ 4_444.00 ] | = -1+x, -1/2-y, -1/2+z |
| e = [ 3_555.00 ] | = -x, -y, -z        | o = [ 4_545.00 ] | = x, -1/2-y, 1/2+z     |
| f = [ 3_555.00 ] | = -x, -y, -z        | s = [ 1_656.00 ] | = 1+x, y, 1+z          |
| g = [ 4_544.00 ] | = x, -1/2-y, -1/2+z | t = [ 4_645.00 ] | = 1+x, -1/2-y, 1/2+z   |
| h = [ 1_655.00 ] | = 1+x, y, z         |                  |                        |

S9

Powder pattern refinement for the high temperature phase of TC08

Number of reflections: 22

Final values: (Standard errors on 2nd line)

| Zero   | Lambda  | a       | b       | c       | alpha | beta  | gamma  |
|--------|---------|---------|---------|---------|-------|-------|--------|
| .00716 | 1.54188 | 16.4182 | 16.4182 | 12.5472 | 90.00 | 90.00 | 120.00 |
| .00372 | .00000  | .0048   | .0048   | .0039   | .00   | .00   | .00    |

Volume: 2929.08 Å<sup>3</sup>

| H | K | L | 2Th(obs) | 2Th-Zero | 2Th(Calc) | diff. |
|---|---|---|----------|----------|-----------|-------|
| 1 | 1 | 0 | 10.818   | 10.811   | 10.777    | .033  |
| 0 | 1 | 2 | 15.424   | 15.417   | 15.438    | -.021 |
| 2 | 1 | 1 | 18.043   | 18.036   | 17.956    | .080  |
| 2 | 0 | 2 | 18.833   | 18.826   | 18.866    | -.040 |
| 1 | 2 | 2 | 21.789   | 21.782   | 21.776    | .005  |
| 1 | 1 | 3 | 23.877   | 23.869   | 23.878    | -.009 |
| 3 | 1 | 2 | 26.796   | 26.789   | 26.701    | .087  |
| 3 | 2 | 1 | 28.189   | 28.182   | 28.269    | -.087 |
| 1 | 4 | 0 | 28.771   | 28.763   | 28.774    | -.010 |
| 2 | 2 | 3 | 30.613   | 30.605   | 30.516    | .090  |
| 0 | 2 | 4 | 31.140   | 31.133   | 31.166    | -.033 |
| 1 | 4 | 3 | 36.140   | 36.133   | 36.043    | .090  |
| 4 | 3 | 1 | 39.192   | 39.185   | 39.204    | -.019 |
| 3 | 1 | 5 | 42.622   | 42.615   | 42.710    | -.095 |
| 4 | 4 | 0 | 44.193   | 44.186   | 44.129    | .057  |
| 4 | 3 | 4 | 48.571   | 48.563   | 48.575    | -.011 |
| 4 | 4 | 3 | 49.602   | 49.595   | 49.472    | .123  |
| 5 | 4 | 1 | 50.797   | 50.790   | 50.670    | .120  |
| 1 | 6 | 4 | 51.244   | 51.237   | 51.218    | .019  |
| 8 | 1 | 1 | 55.682   | 55.675   | 55.721    | -.045 |
| 1 | 3 | 7 | 56.470   | 56.462   | 56.386    | .076  |
| 5 | 4 | 4 | 58.700   | 58.693   | 58.632    | .061  |