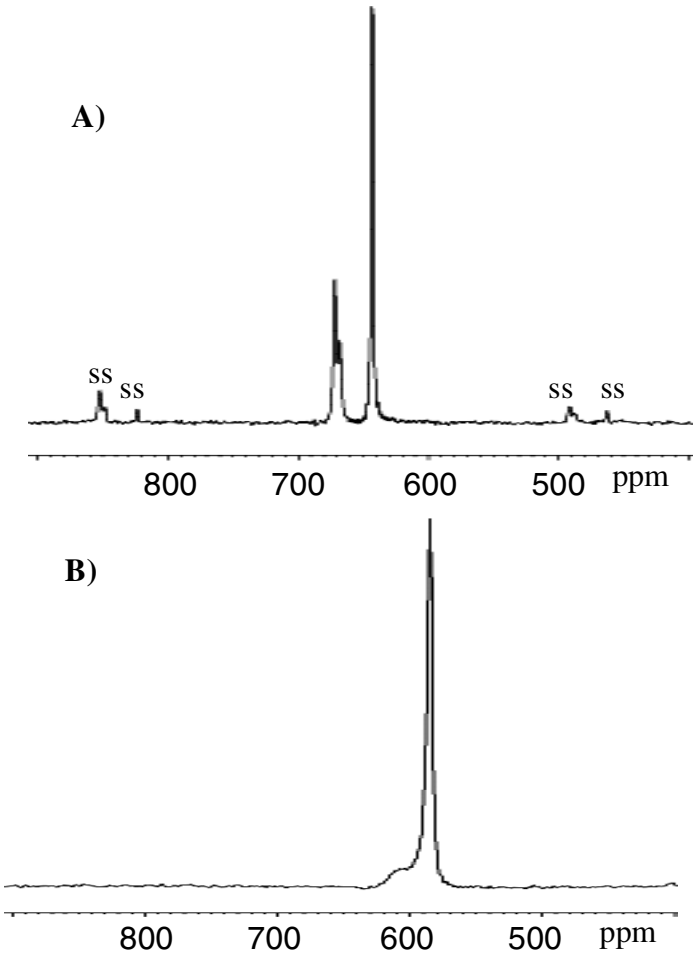
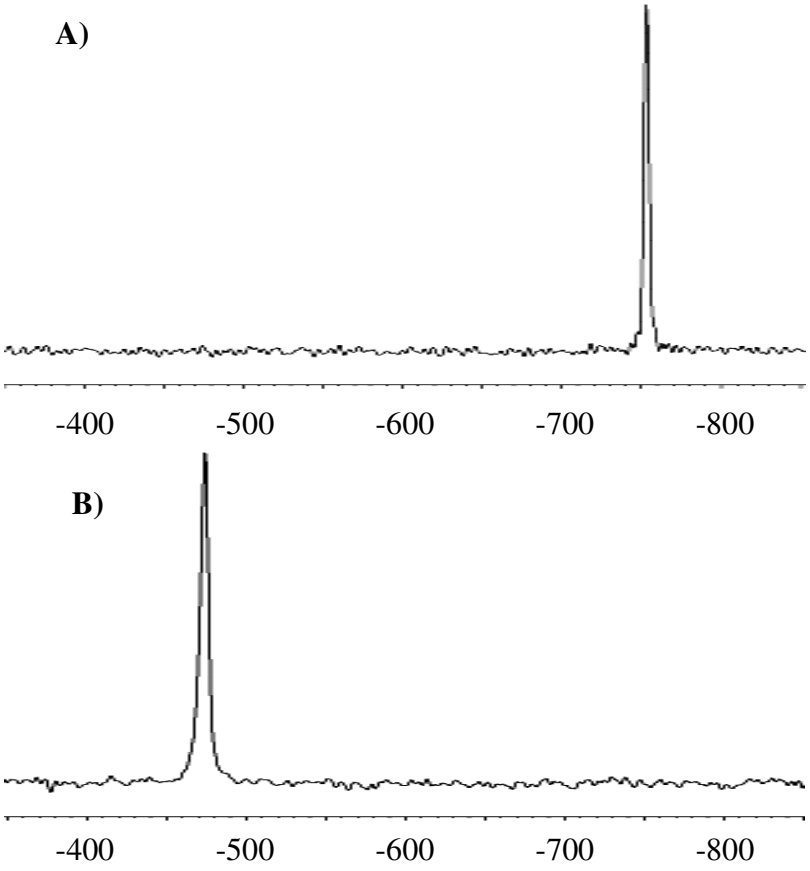
**Supplemental Figures.**




**Supplemental Figure 1**. A. $^{113}Cd$ CPMAS NMR of the precursor, $Li_4[Se_4Cd_{10}(SPH)_{16}]$. The peak at 643 ppm represents cadmiums tetrahedrally coordinated to thiophenol. The peaks at 668 and 672 ppm represent axial and equitorial cadmium, respectively, that are coordinated to selenium and thiophenol; the spinning sidebands of these cadmiums are marked with ss. (Lee, G. et al. *Inorg. Chem.* **1993**, *32*, 66-72.)
B. $^{113}Cd$ Hahn echo NMR of bulk hexagonal CdSe.




**Supplemental Figure 2**. A. $^{77}$Se CPMAS NMR of the precursor, $Li_4[Se_4Cd_{10}(SPH)_{16}]$. B. $^{77}$Se Hahn echo NMR of bulk hexagonal CdSe.

**Supplemental Figure 3**. The integrated $^{77}$Se peak intensities from $^{1}$H-$^{77}$Se CPMAS were plotted as a function of contact time, τ. The plot was fit to equation 1 using a nonlinear least squares analysis to determine the cross-relaxation time constants, $T_{SeH}$.