Supporting information for

Nanotubes from the misfit compound alloy LaS-$Nb_xTa_{(1-x)}S_2$

Dalit Stolovas[†⊥], Marco Serra[†⊥], Ronit Popovitz-Biro[†], Iddo Pinkas[‡], Lothar Houben[‡], José J. Calvino[§//], Ernesto Joselevich[†], Reshef Tenne[†*], Raul Arenal[#¶*] and Luc Lajaunie[§//#*]

[†] Department of Materials and Interfaces, Weizmann Institute, Rehovot 76100, Israel

[‡] Department of Chemical Research Support, Weizmann Institute, Rehovot 76100, Israel

[§] Departamento de Ciencia de los Materiales e Ingeniería Metalúrgica y Química Inorgánica, Facultad de Ciencias, Universidad de Cádiz, Campus Río San Pedro S/N, Puerto Real 11510, Cádiz, Spain

[//] Instituto Universitario de Investigación de Microscopía Electrónica y Materiales (IMEYMAT), Facultad de Ciencias, Universidad de Cádiz, Campus Río San pedro S/N, Puerto Real 11510, Cádiz, Spain

[#] Laboratorio de Microscopías Avanzadas, Instituto de Nanociencia de Aragón, Universidad de Zaragoza, 50018 Zaragoza, Spain

[¶] ARAID Foundation, 50018 Zaragoza, Spain

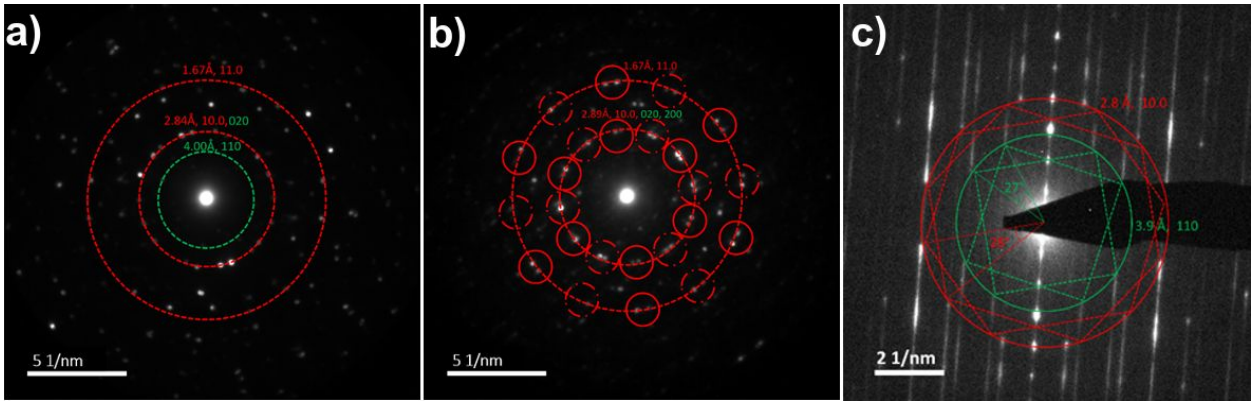


Fig. S1. ED in STEM mode of a. nanotube prepared from 20 %at Nb, b. 40 at% Nb, c. 80 at %. the ED of a 80 at% Nb tube. The green and red circles are overlaid on the reflections from the (110) planes of the LaS layers and the (100) planes of the $Nb_xTa_{(1-x)}S_2$ slabs of the nanotube, respectively.

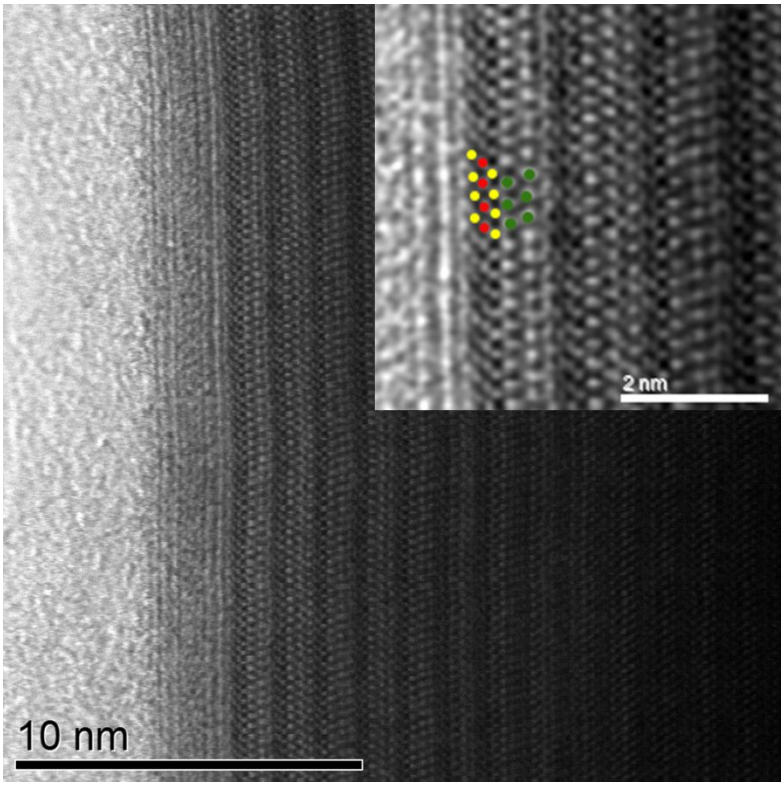


Fig. S2. HR-STEM BF of the nanotube shown in **Fig. 6** (prepared from 80 at% Nb concentation). The inset shows a magnified view of the filtered image superposed with the atomic model (green: La, red : Ta/Nb, yellow : S). Note the 1T (octahedral) structure of the hexagonal LaS-$Nb_xTa_{(1-x)}S_2$ lattice.

NT normal 1	Center (180 nm from surface)
Element	Atomic Fraction (%)
S	65.78
Nb	8.40
La	17.04
Ta	8.78
Nb/Ta	0.96
La/(Nb+Ta)	0.99
Nb+Ta for 1.15 La	1.16

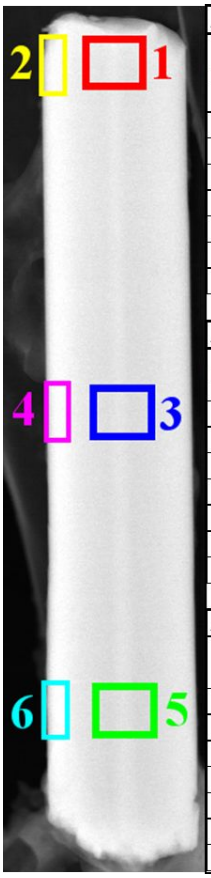
NT normal 1	90 nm from surface
Element	Atomic Fraction (%)
S	63.24
Nb	8.14
La	18.36
Ta	10.26
Nb/Ta	0.79
La/(Nb+Ta)	1.00
Nb+Ta for 1.15 La	1.15

NT normal 1	30 nm from surface
Element	Atomic Fraction (%)
S	68.39
Nb	6.69
La	15.25
Ta	9.67
Nb/Ta	0.69
La/(Nb+Ta)	0.93
Nb+Ta for 1.15 La	1.23

Table S1. Results of the EDS quantification performed in various areas of the nanotube with a normal periodicity (shown in **Fig. 6a**).

NT normal 1	Extreme surface
Element	Atomic Fraction (%)
S	17.22
Nb	1.46
La	60.11
Ta	21.20
Nb/Ta	0.07
La/(Nb+Ta)	2.65
Nb+Ta for 1.15 La	0.43

Fig. S3. *Top:* HR-STEM HAADF of the NT shown in Fig. 6a. *Bottom:* Results of the EDS quantification performed at the area highlighted by the red square.



Area 1	High center
Element	Atomic Fraction (%)
S	60.80
Nb	17.09
La	17.09
Ta	5.02
Nb/Ta	3.40
La/(Nb+Ta)	0.77
Nb+Ta for 1.15 La	1.49

Area 2	High surface
Element	Atomic Fraction (%)
S	54.80
Nb	19.80
La	18.97
Ta	6.43
Nb/Ta	3.08
La/(Nb+Ta)	0.72
Nb+Ta for 1.15 La	1.59

Area 3	Middle center
Element	Atomic Fraction (%)
S	61.67
Nb	10.90
La	17.53
Ta	9.90
Nb/Ta	1.10
La/(Nb+Ta)	0.84
Nb+Ta for 1.15 La	1.36

Area 4	Middle surface
Element	Atomic Fraction (%)
S	61.67
Nb	10.90
La	17.53
Ta	9.90
Nb/Ta	1.31
La/(Nb+Ta)	1.00
Nb+Ta for 1.15 La	1.15

Area 5	Low center
Element	Atomic Fraction (%)
S	63.41
Nb	7.92
La	17.79
Ta	10.88
Nb/Ta	0.73
La/(Nb+Ta)	0.95
Nb+Ta for 1.15 La	1.22

Area 6	Low center
Element	Atomic Fraction (%)
S	53.09
Nb	15.18
La	19.79
Ta	11.94
Nb/Ta	1.27
La/(Nb+Ta)	0.73
Nb+Ta for 1.15 La	1.58

Fig. S4. Results of the EDS quantification performed in various areas of the nanotube showing a juxtaposition of normal and double periodicity.

NT double 1			NT double 2	
Element	Atomic Fraction (%)		Element	Atomic Fraction (%)
S	56.41		S	53.34
Nb	17.5		Nb	15.06
La	20.12		La	21.66
Ta	5.97		Ta	9.93
Nb/Ta	2.93		Nb/Ta	1.52
La/(Nb+Ta)	0.86		La/(Nb+Ta)	0.87
Nb+Ta for 1.15 La	1.34		Nb+Ta for 1.15 La	1.33

Table S2. Results of the EDS quantification performed on two different nanotubes showing a double periodicity.

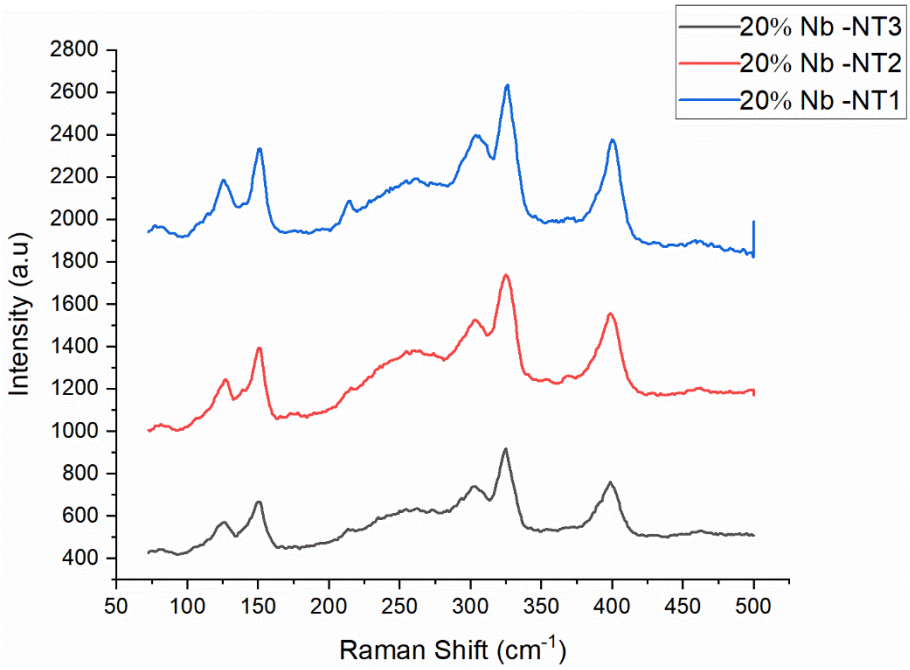


Fig. S5. Raman spectra of a few MLC LaS-$Nb_xTa_{(1-x)}S_2$ nanotubes prepared from a precursor containing 20 at% niobium (and 80 at% tantalum). The spectra does not vary much from one tube to the other.

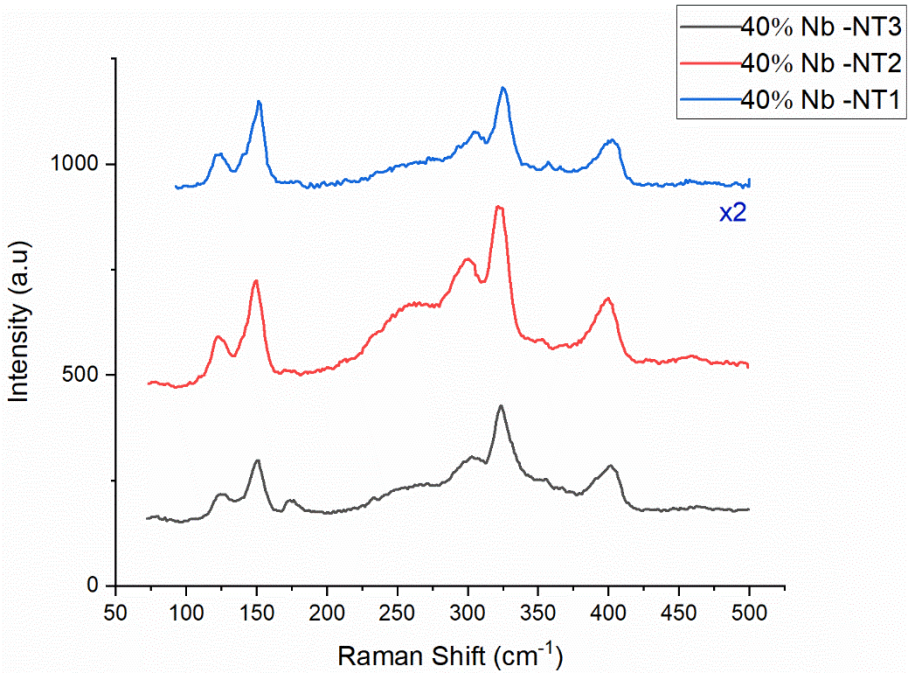


Fig. S6. Raman spectra of a few MLC LaS-$Nb_xTa_{(1-x)}S_2$ nanotubes prepared from a precursor containing 40 at% niobium (and 60 at% tantalum). All spectra look quite similar.

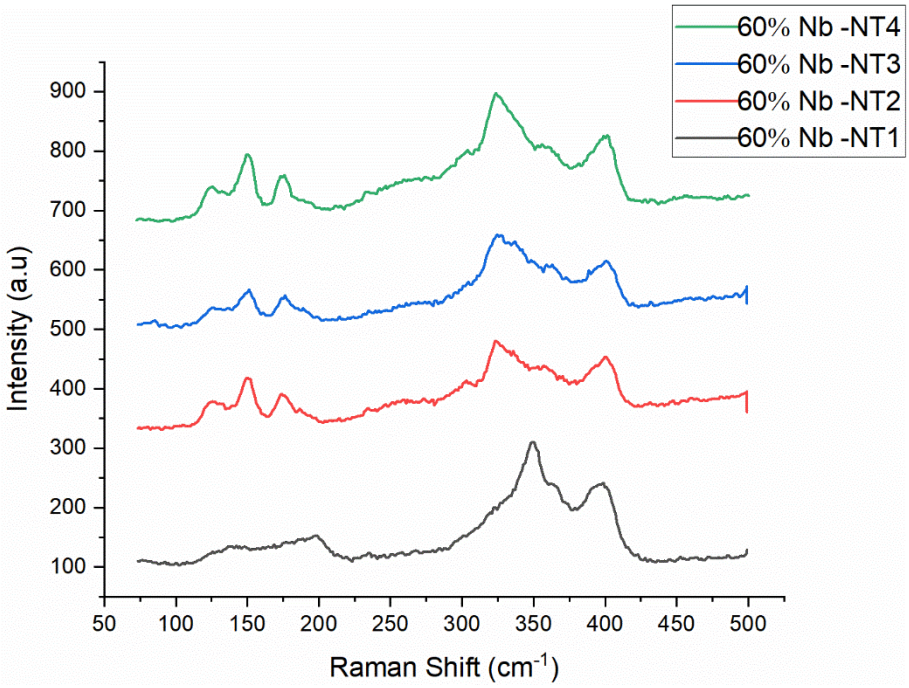


Fig. S7. Raman spectra of a few MLC LaS-$Nb_xTa_{(1-x)}S_2$ nanotubes prepared from a precursor containing 60 at% niobium (and 40 at% tantalum).

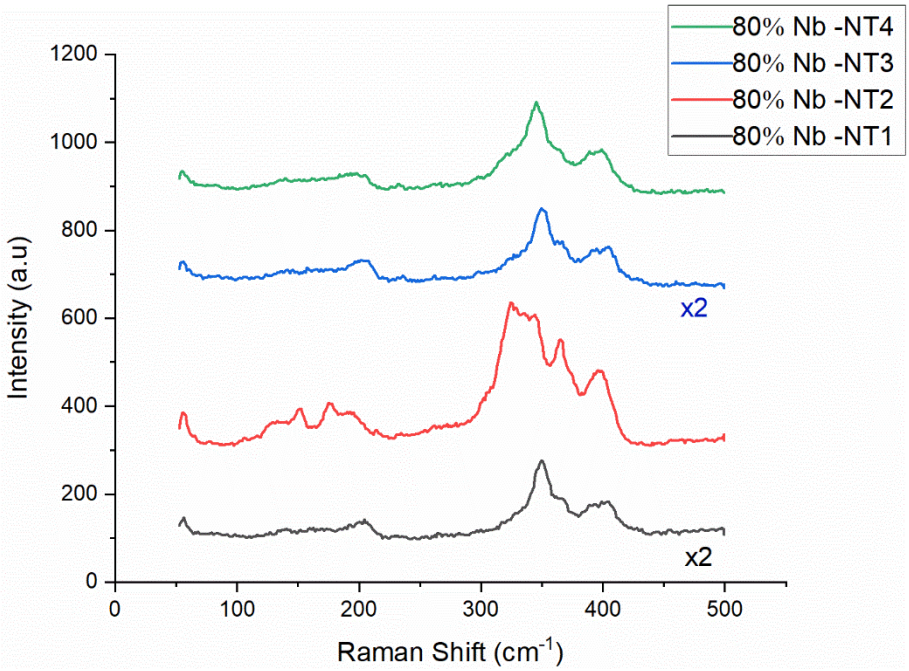


Fig. S8. Raman spectra of a few MLC LaS-$Nb_xTa_{(1-x)}S_2$ nanotubes prepared from a precursor containing 80 at% niobium (and 20 at% tantalum)

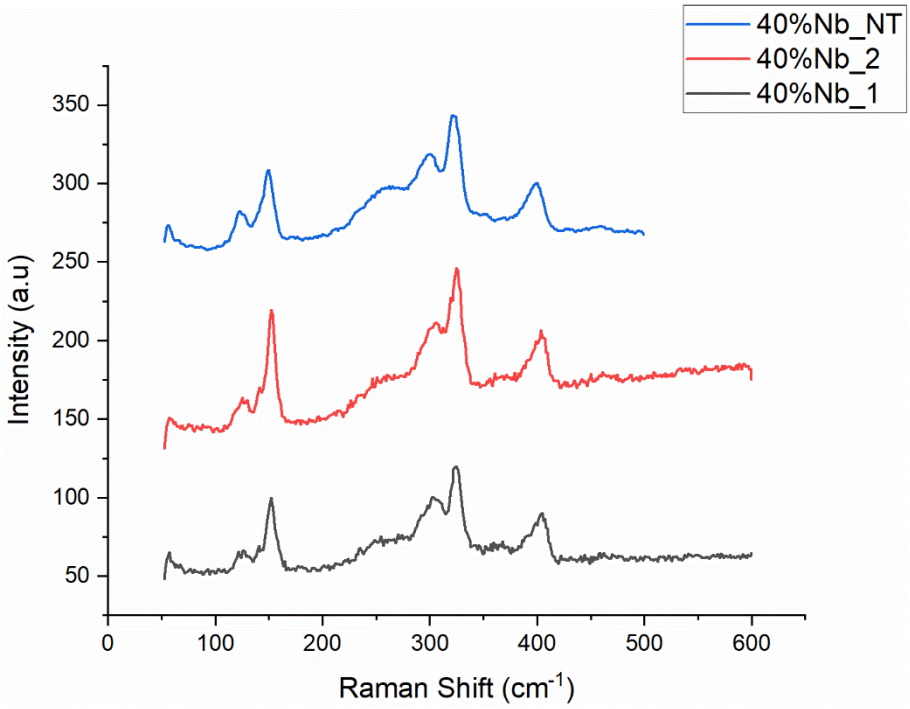


Fig. S9. Raman spectra of a few MLC LaS-$Nb_xTa_{(1-x)}S_2$ platelets prepared from a precursor containing 40 at% niobium (and 60 at% tantalum). Note the similarity to the spectra in **Fig. S6**. However, the peaks are much narrower in the case of the platelets compared to the tubes, which is indicative of the higher crystalline order of the platelets.

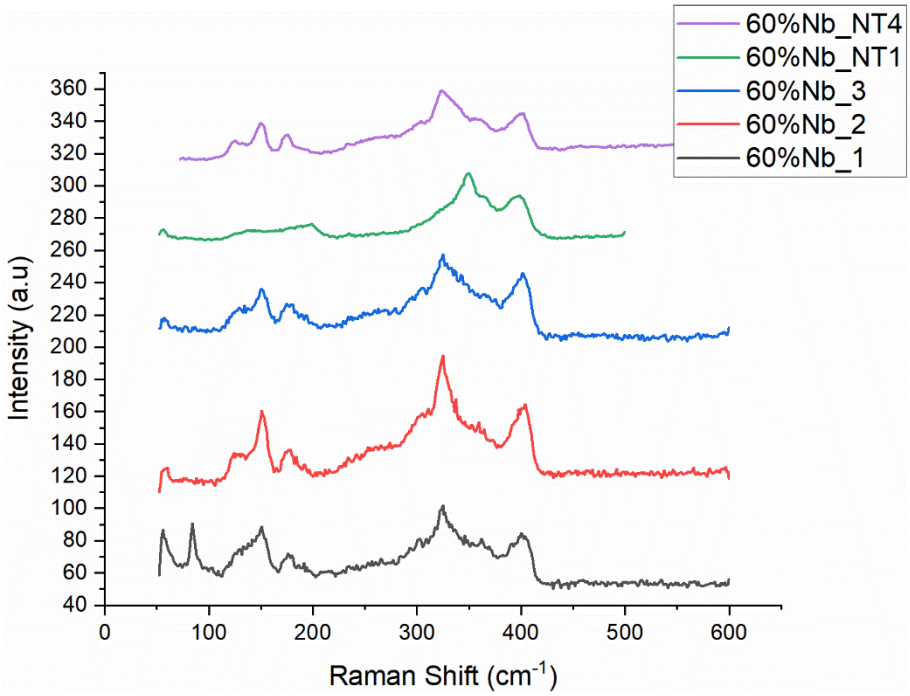


Fig. S10. Raman spectra of a few MLC LaS-$Nb_xTa_{(1-x)}S_2$ platelets prepared from a precursor containing 60 at% niobium (and 40 at% tantalum). The peak in 175 cm^{-1} is typical for the tubes (platelets) with high Nb content.

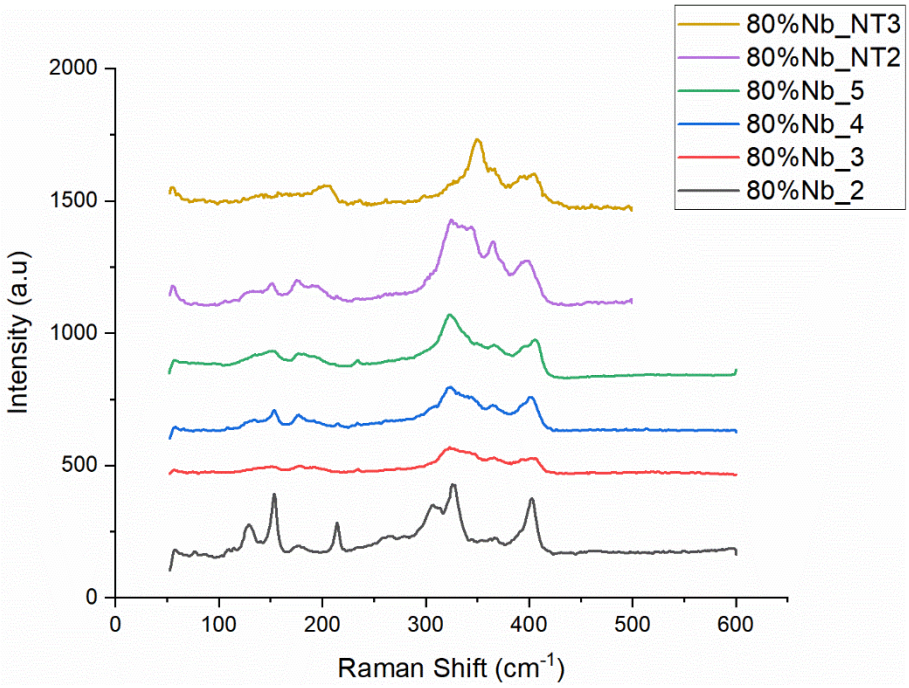


Fig. S11. Raman spectra of a few MLC LaS-$Nb_xTa_{(1-x)}S_2$ platelets prepared from a precursor containing 80 at% niobium (and 20 at% tantalum).