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Electronic Supplementary Information

Phase pure Ni₃S₂ and NiS from *bis*(N'-ethyl-N-piperazinylcarbodithioato-S,S')-nickel(II) via solvent thermolysis and Aerosol Assisted Chemical Vapour Deposition

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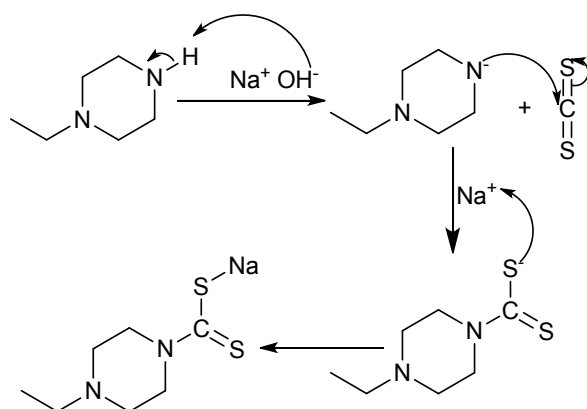
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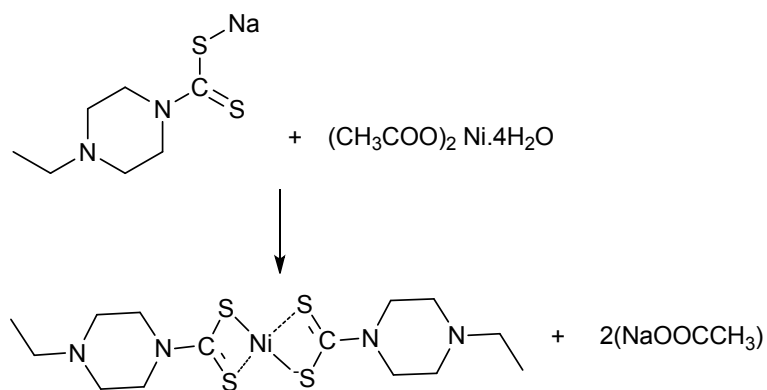
Table S1: Crystal data and structure refinement details for [Ni(Etpz-dtc)₂].

Crystal Data	[Ni(Etpz-dtc) ₂],
Chemical formula	C ₁₄ H ₂₆ N ₄ NiS ₄
Molar mass (g mol ⁻¹)	437.32
Crystal system, space group	Triclinic, <i>P</i> -1
Temperature (K)	100(2)
<i>a</i> , <i>b</i> , <i>c</i> (Å)	6.5759(4), 8.4895(5), 8.8346(5)
α , β , γ (°)	84.185(2), 78.947(3), 80.038(3)
<i>V</i> (Å ³)	475.57(5)
<i>Z</i>	1
Radiation type	Mo K α
μ (mm ⁻¹)	1.46

Crystal size (mm)	0.12 × 0.09 × 0.02
<i>Data Collection</i>	
Diffractometer	Bruker APEXII CCD diffractometer
Absorption correction	Multi-scan, SADABS
T_{\min} , T_{\max}	0.692, 0.746
No. of measured, independent and observed	8678, 2259, 2174
$[I > 2\sigma(I)]$ reflections	
R_{int}	0.017
<i>Refinement</i>	
$R[F^2 > 2\sigma(F^2)]$, $wR(F^2)$, S	0.018, 0.047, 1.04
No. of reflections	2259
No. of parameters	107
H-atom treatment	H-atom parameters constrained
$\Delta\rho_{\text{max}}$, $\Delta\rho_{\text{min}}$ ($\text{e } \text{\AA}^{-3}$)	0.43, -0.18



Scheme S1: Mechanism for preparation of sodium ethyl piperazine dithiocarbamate ligand



Scheme S2: Mechanism for the preparation of *bis*-(N'-ethyl-N-piperazinylcarbodithioato-S,S')-nickel(II) complex

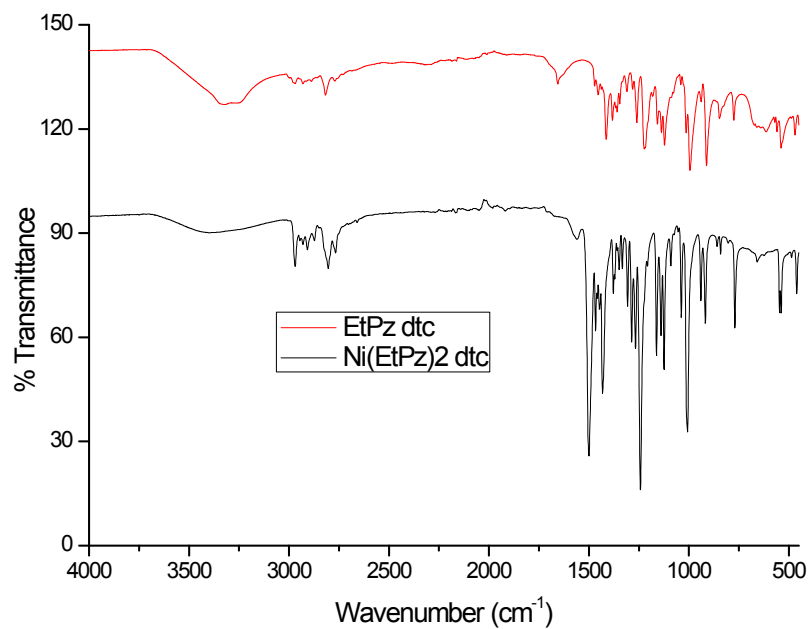


Figure S1: – FT-IR analysis of the ligand and nickel complex

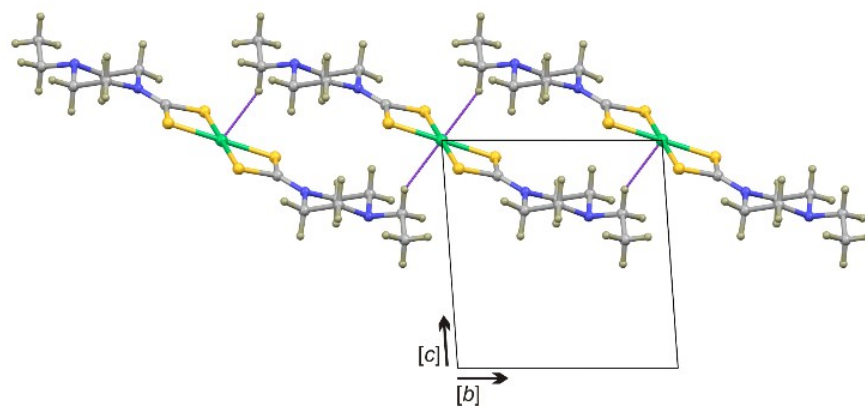


Figure S2: One-dimensional chain of $[\text{Ni}(\text{Etpz-dtc})_2]$

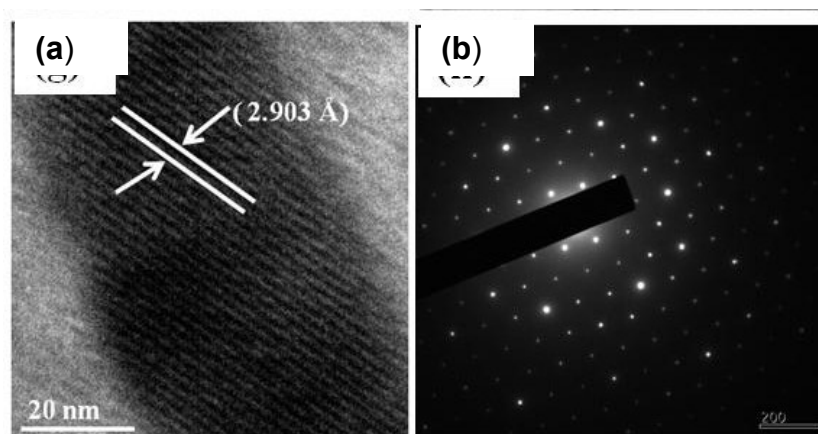


Figure S3: (a) HRTEM image for nickel sulfide nanoparticles capped by HDA at 270 °C, (b) SAED pattern for Ni_3S_2 at 270 °C

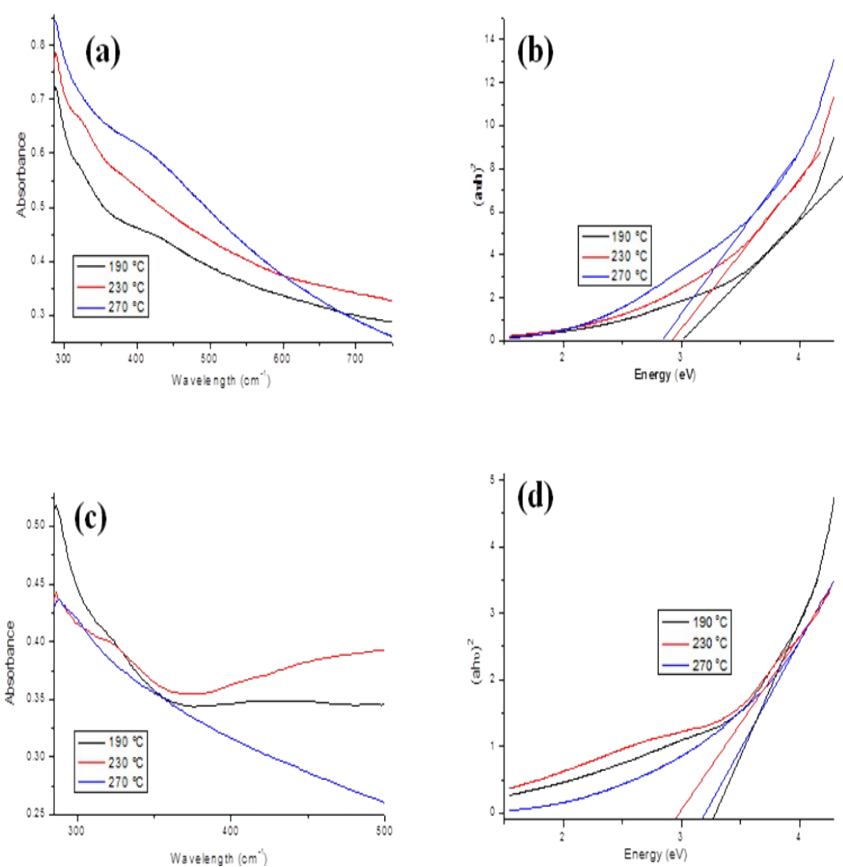


Fig. S4. UV-Vis spectra and Tauc plots for (a) and (b) HDA capped Ni₃S₂ nanoparticles and (c) and (d) OLA capped Ni₃S₂ nanoparticles at different temperatures

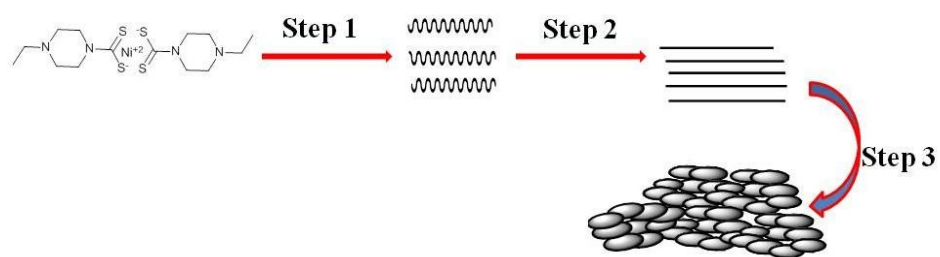


Fig. S5: Plausible mechanism for temperature dependent morphological evolution of as deposited Ni-S thin films

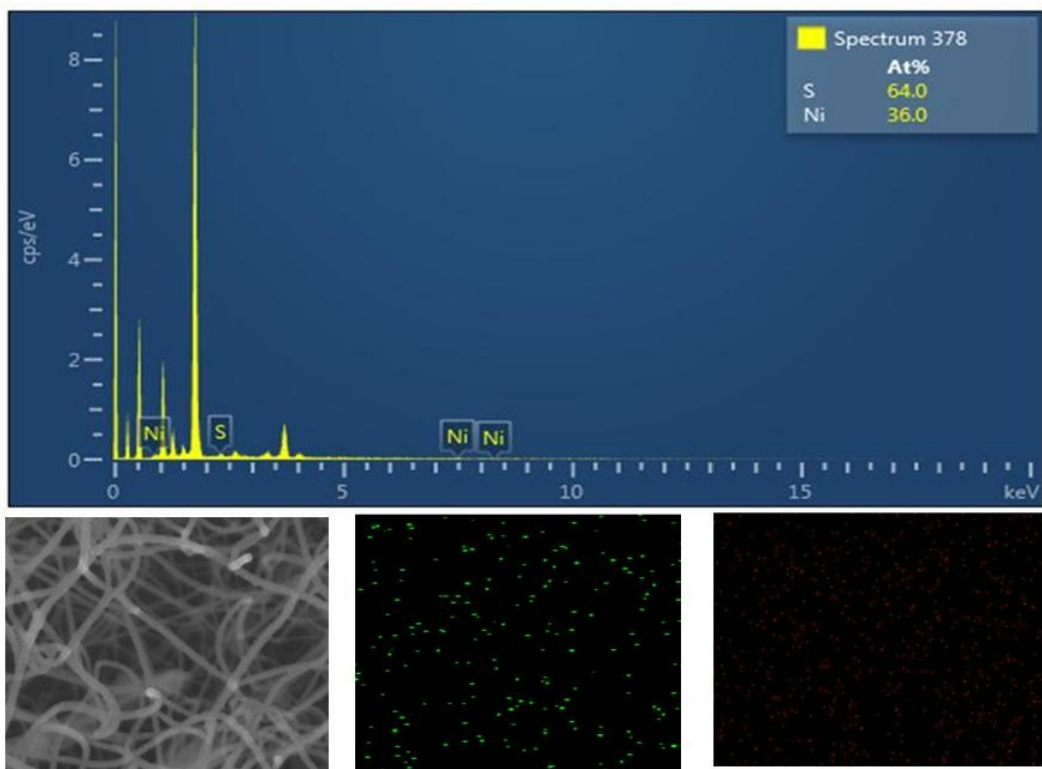


Figure S6: EDX for Ni-S thin films and Elemental mapping

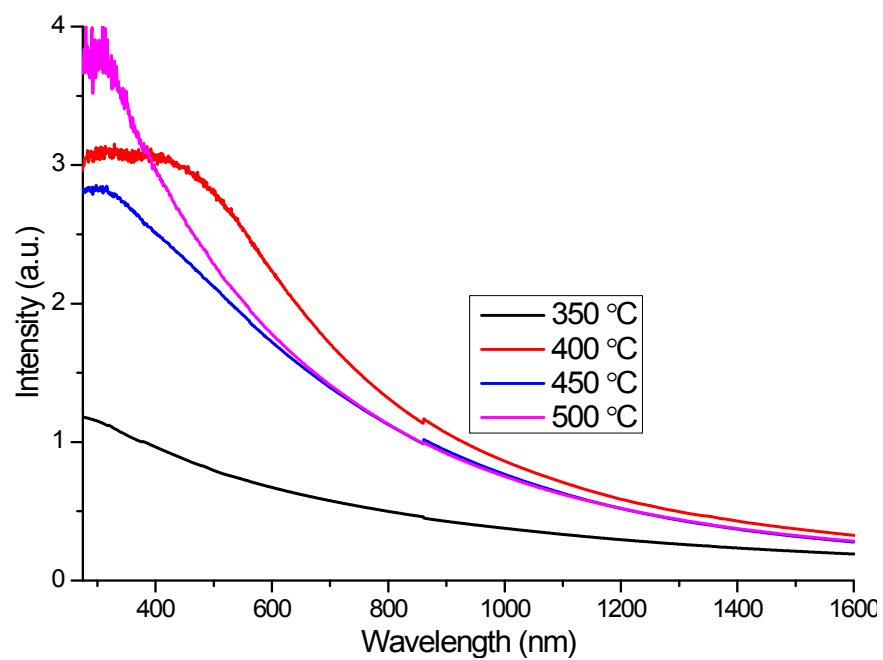


Figure S7: UV-Vis absorption spectra for nickel sulfide thin films deposited on a glass substrate at different temperatures