

Fig. S1: View of the structure of  $[\text{MoO}_2(\text{O}(\text{CH}_2)_3\text{S}(\text{CH}_2)_3\text{O})_2]$  (1) without hydrogen atoms (with numbering scheme, 'A' indicating atoms at equivalent positions (1-x,-y,-z)). Ellipsoids are drawn at 50% probability.

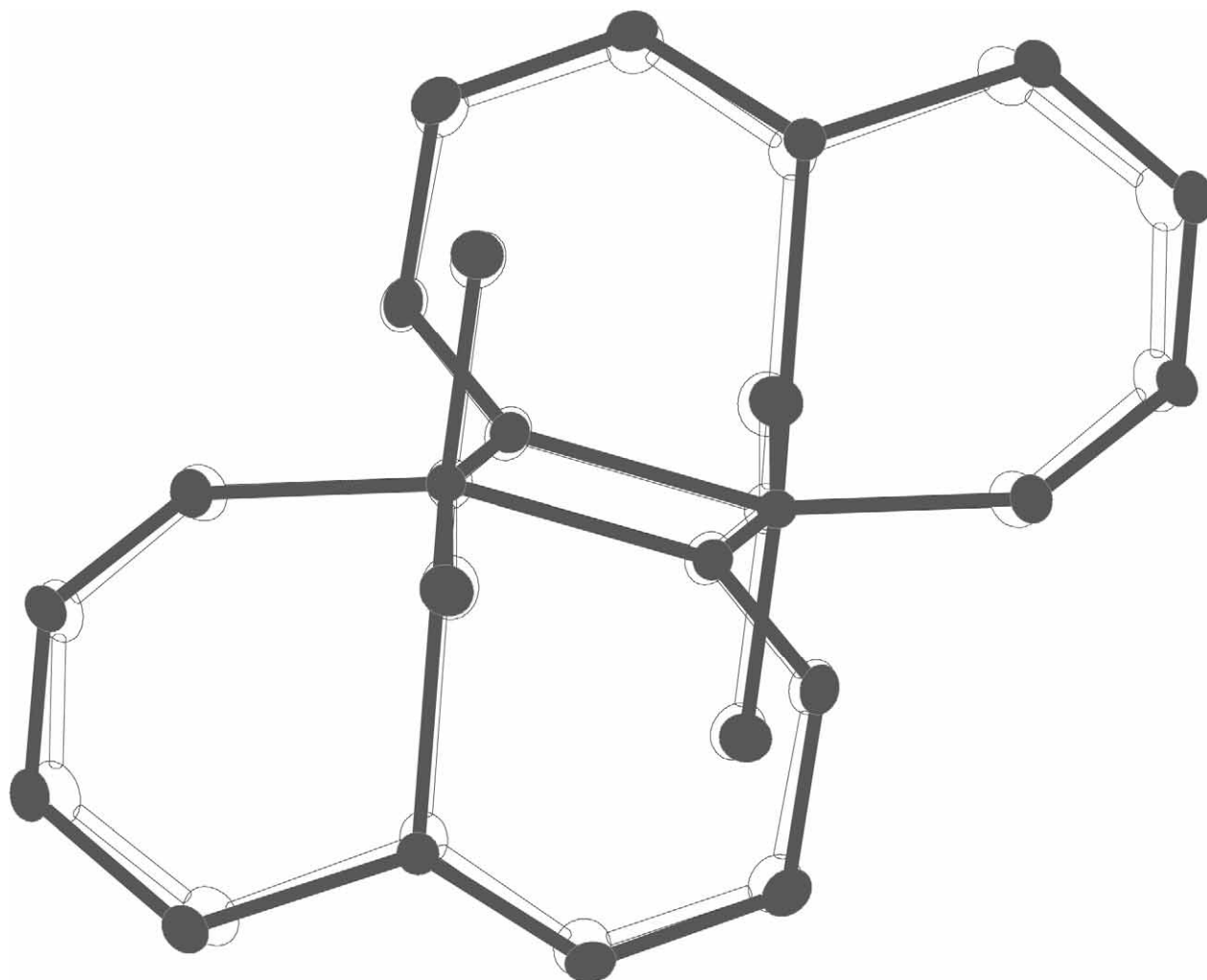


Fig. S2: Superimposition of the structures of  $[\{\text{MoO}_2(\text{O}(\text{CH}_2)_3\text{S}(\text{CH}_2)_3\text{O})\}_2]$  (**1**) in white and  $[\{\text{MoO}_2(\text{O}(\text{CH}_2)_3\text{Se}(\text{CH}_2)_3\text{O})\}_2]$  (**2**) in gray as ball and stick models.

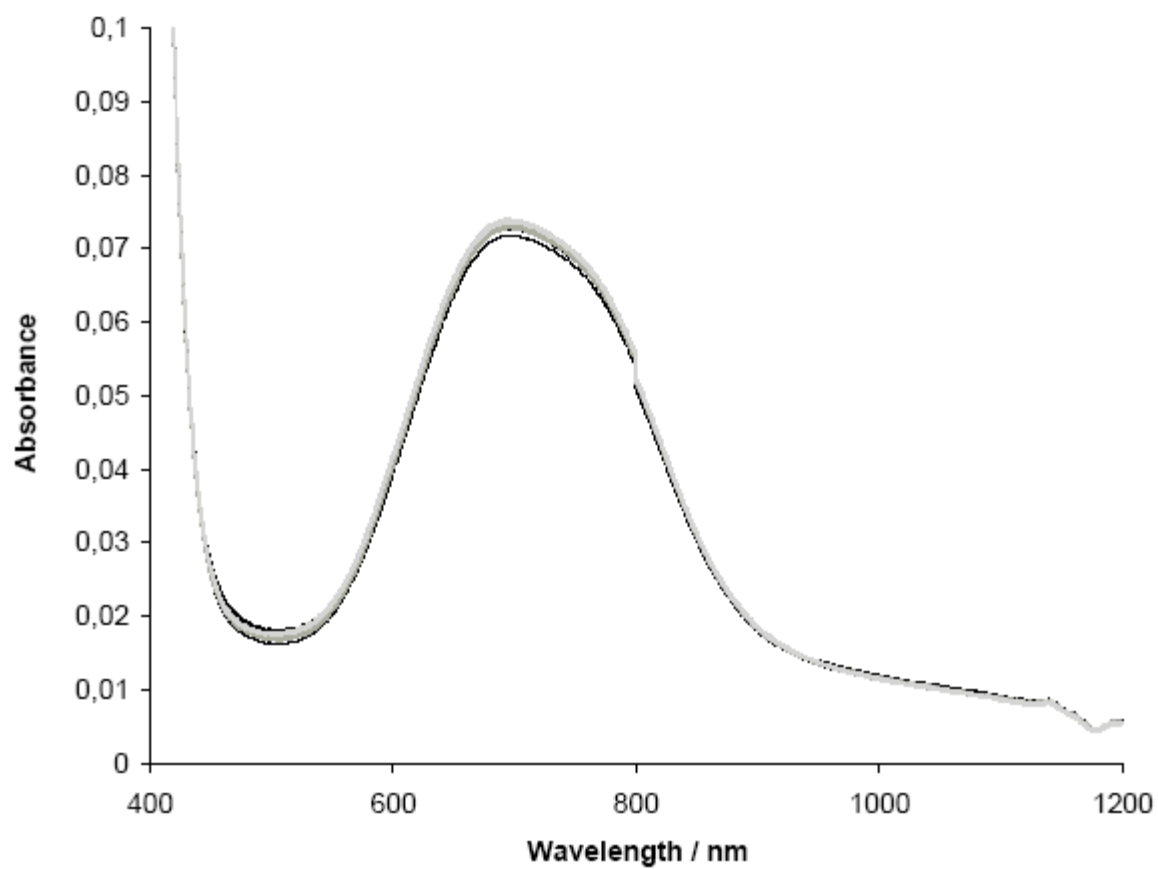


Fig. S3: UV-Vis spectra of **2** in DMSO with PPh<sub>3</sub> (Mo:PPh<sub>3</sub> 1:7.5) monitored 12 h.