Activating chalcogen bond interactions using tetrathiafulvalene: from anion binding to conducting materials

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The ability to control intermolecular interactions is important in materials science including molecular sensing, binding and molecular conductors. Despite the flourishing development of halogen bonding (XB) in the past two decades, harnessing chalcogen bonding (ChB) for crystal engineering remains challenging mainly due to the lack of directionality.[1] In our group, we developed different strategies to design outstanding XB- and ChB-donors towards strong and directional recognition of Lewis bases.[2,3] In this presentation, we will discuss use of redox-active tetrathiafulvalene (TTF) moiety coupled to a chalcogen center to activate the local ChB donor potency upon oxidation. Newly developed TTFs indeed show the strong activation of σ-holes on the chalcogen atoms, to efficiently interact with halide anions in solid-state. Moreover, reactions of the developed TTFs with TCNQ-derivatives afford conducting charge transfer (CT) salts, where the presence of ChB interactions contributes to a difference in the degree of charge transfer hence in their conducting behavior.

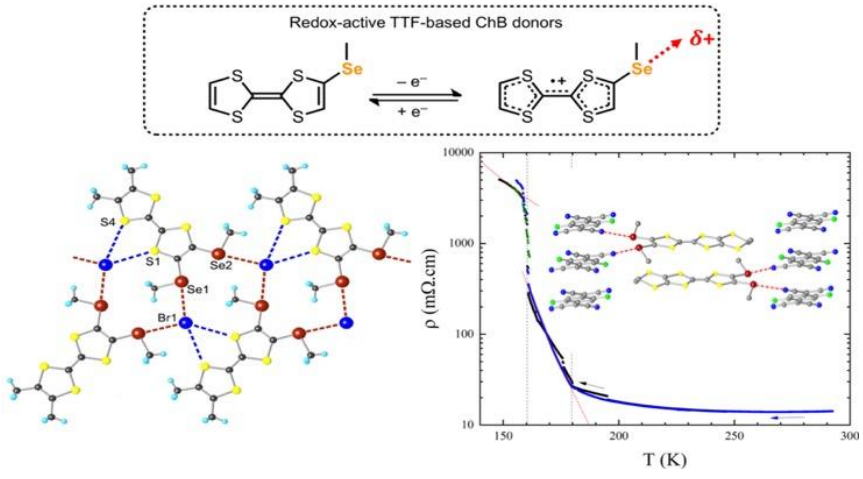

Fig. 1. ChB activation in oxidized $(MeSe)_2TTFs$ for anion recognition (left) and for conducting CT salt (right)

References

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