

Gold Bisdithiolene Complexes with Peripheral Selenophene and Selenacyclopentane Units

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The so called Single Component Molecular Metals (SCMM) are molecules that display transport properties characteristic of metals, that are thought to rise from the intermolecular interactions in the solid state.^[1] SCMM are usually transition metal bisdithiolene complexes and $[\text{Au}(\alpha\text{-tpdt})_2]^0$ and $[\text{Ni}(\text{tmdt})_2]^0$ were the first known examples.^[2,3] Their neutral nature and the possibility of molecular engineering to develop multifunctional materials are the main advantages of these materials, but the poor solubility is the main limitation for application of SCMM in electronic devices.

The aim of this work was to prepare transition metal bisdithiolene/bisdiselenolene complexes that will potentially give rise to molecular materials that are electrical conductors or semiconductors, but soluble and consequently easy to process as thin films. Two new gold bisdithiolene complexes, $[\text{Au}(\alpha\text{-spdt})_2]^0$ and $[\text{Au}(\alpha\text{-scpdt})_2]^0$, that have a peripheral five member ring with selenium were prepared and both revealed a semiconducting behaviour. The transport properties of $[\text{Au}(\alpha\text{-spdt})_2]^0$ were measure in a polycrystalline sample revealing a room temperature electrical conductivity of $7.2 \times 10^{-3} \text{ S.cm}^{-1}$. The magnetic properties were also measured and revealed a paramagnetic behaviour, resembling a Pauli like behaviour, with a room temperature paramagnetic susceptibility of $1.03 \times 10^{-4} \text{ emu/mol}$. The transport properties of $[\text{Au}(\alpha\text{-scpdt})_2]^0$ were measure in a crystalline sample, revealing a room temperature electrical conductivity of 0.103 S.cm^{-1} .

$[\text{Au}(\alpha\text{-spdt})_2]^0$ and $[\text{Au}(\alpha\text{-scpdt})_2]^0$ are just the first complexes of a new family of transition metal bisdithiolene and bisdiselenolene complexes with selenophene and selenacyclopentane units, that we intend to study.

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