

# Molecular Metal Wires and Molecular Switches

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## Abstract

Owing to their fascinating bonding nature, the metal-metal (M-M) multiple bonds in dinuclear metal complexes have been an interesting and vital research topic. During the past decade, our seminal and systematic approaches on the all-syn oligo-( $\alpha$ -pyridyl)amido ligands coordinated metal ions have successfully opened up a new chapter, extending this territory from dinuclear to linear oligonuclear metal complexes. Their unique features in structures and bonding characterization have been thoroughly investigated, which, according to the M-M bonding strength, can be classified into two categories, namely the oligonickel(II) complexes lacking an M-M bond and the oligochromium(II) complexes with a strong M-M bonding formation. Depending on the specificity and number of metal ions, structures and magnetic behaviors of the corresponding metal complexes are systematically analyzed. Their potential application as a molecular metal wire is conveyed on the basis of the band structures calculated from hypothetical one-dimensional metal strings. Moreover, self-assembled monolayers of *n*-alkanethiols are employed as a two-dimensional matrix to isolate the metal string complexes, of which the scanning tunneling microscopy (STM) image exhibits remarkable protrusion characteristics. For tricobalt and trichromium complexes, the topographic STM images reveal that the protruding features are, respectively, 0.3 nm and 0.6 nm higher than that of the trinickel complexes. The trend of increasing conductivity correlates well with their associated bond orders, and is also in consistence with qualitative EHMO approaches.

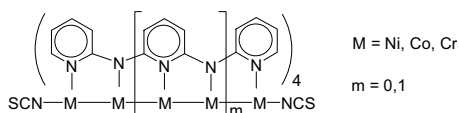


Figure 1. Structure of metal string complexes

The ET efficiency of metal strings is altered significantly upon oxidation. It demonstrates that their ET properties can be manipulated and shed light on the potential applications such as molecular switches.

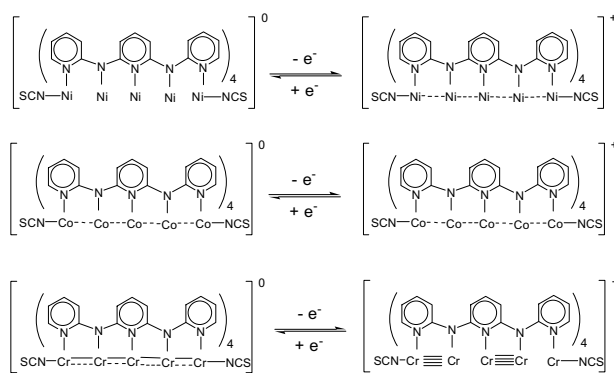


Figure 2. Bonding description of metal string complexes upon oxidation

## Reference

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