In-situ Conductivity of a Series of Conjugated Metallopolymers

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Much interest has been devoted to electronically conducting organic polymers, and to materials consisting of a conjugated polymer linked to redox active metal centres. The conjugated backbones of the latter materials may serve to increase the electronic coupling between the metal centres and thus the overall rate at which charge is propagated through the polymer. [1]

We have previously demonstrated the formation of rod-like polymers by electropolymerisation of thienyl-substituted ruthenium bis-terpyridine complexes.[2]

In this contribution, we report the formation and conductivity of a series of oligothienyl-bridged $M(terpy)_2$, {M = Os(II), Ru(II)}, metallopolymers where extensive charge delocalisation is possible.

In-situ dc conductivity measurements were carried out using polymerfilms deposited by electrochemical polymerisation onto interdigitated microelectrode arrays.

The materials display conductivity maxima centered on the formal potential of the polymer, typical of redox conduction.

The conductivity of this type of polymer is significantly higher than that of similar non-conjugated polymers, demonstrating the overall charge transport rate-enhancing effect of the conjugated bridges.

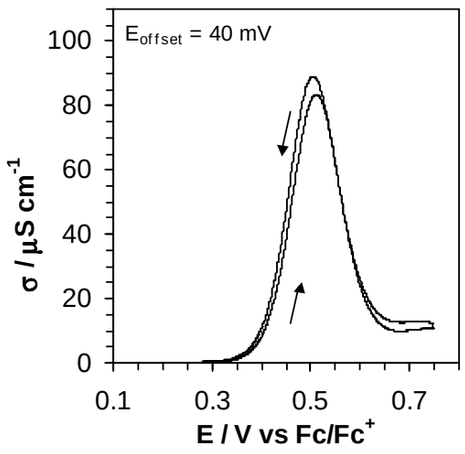

Figure 1: DC conductivity as a function of potential of the tetrathienyl-bridged $Os(tpy)_2$ polymer.

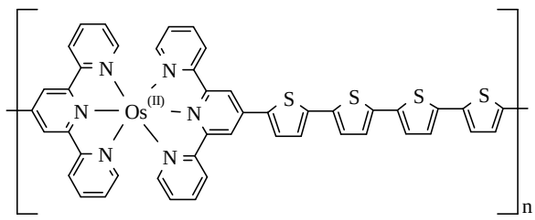

Figure 2: *Proposed structure of the tetrathienyl-bridged polymer.*

[1] P.G. Pickup, *J. Mater. Chem.*, 1999, 9, 1641-1653
[2] J. Hjelm, E.C. Constable, E. Figgemeier, A. Hagfeldt, R. Handel, C.E. Housecroft, E. Mukhtar, E. Schofield, *Chem. Commun.*, 2002, 284-285