

## Preparation, Characterisation and Electrical Properties of Metal/polymer-DNA Nanohybrids

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**Abstract :** Conducting polymer of N-(3-pyrrol-1-yl-propyl)-2,2'-bipyridinium hexafluoro-phosphate (PPBH) was prepared via chemical and electrochemical polymerization methods. The bulk polymer showed conductivity in the order of  $10^{-12}$  S cm<sup>-1</sup>. DNA-templated polymer nano wires of PPBH (PolyPPBH-DNA) have been chemically prepared then used as templates to direct the formation of metal nanowires (Cu) in order to enhance the electrical properties of the polymer/DNA wires. The chemical structures, morphology and the electrical characterisation of the as obtained structures have been characterized through spectroscopic (FTIR, UV-vis and XPS), single-crystal X-ray diffraction and microscopic (AFM, EFM and c-AFM) techniques. The morphology of the nanomaterials has been observed by AFM; showing the nanowires are uniform and continuous. The polymer conductivity was slightly improved after metallization. The conductivity of Cu-PolyPPBH-DNA nanowires was estimated to be  $7.1 \times 10^{-2}$  S cm<sup>-1</sup>. This conductivity is slightly higher than the conductivity of PolyPPBH-DNA nano wires ( $2.0 \times 10^{-2}$  S cm<sup>-1</sup>), but it is lower than the measurements for PPy/DNA nano wires ( $2.1 \times 10^{-1}$  S cm<sup>-1</sup>) prepared and measured by using c-AFM probe. These results reflect the large effect of the chemical structure (N-substitution) on the electrical properties of these polymers by reducing the extended conjugation.

**Keywords :** DNA, template, nano wires, N-Alkylatedpyrrole, copper

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