

# **Synthesis, characterization and properties of polythiophenes modified with mesogenic group spacers with different chain lengths**

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## **Abstract**

A new family of conjugated polymers formed by 3-alkyloximethylthiophenes substituted with a biphenylcarbonitril group was synthesized by a route involving first the coupling of a functionalized alkyl chain, from 6 to 12 carbon atoms, to 3- methanolthiophene, and then the attachment of the mesogenic group. The monomeric units were characterized by conventional techniques. Thermal studies were also carried out. The polymerization of these monomers was accomplished by chemical oxidation with  $\text{FeCl}_3$ , and the resulting polymers were characterized by FT-IR spectroscopy, elemental microanalysis, and XPS. Subsequently, these materials were doped with  $\text{I}_2$  and characterized by the same above-mentioned techniques. Conductivity measurements indicate that the polymers lie within the semiconductor range. Electrochemical polymerization of these monomers was also performed. XPS analysis and theoretical calculations revealed that both the biphenyl group and the thiophene ring are simultaneously oxidized during the electrochemical synthesis of the product, giving rise to an overoxidized material.

## **Keywords**

Theoretical Calculation, Biphenyl,  $\text{FeCl}_3$ , Thiophene, Alkyl Chain.