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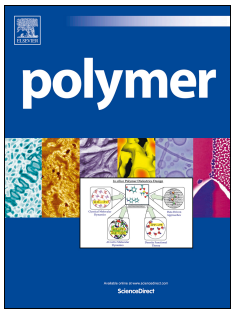

In-situ synthesis of thiophene-based multifunctional polymeric networks with tunable conductivity and high photolithographic performance

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In-Situ Synthesis of Thiophene-based Multifunctional Polymeric Networks with Tunable Conductivity and High Photolithographic Performance

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Design of novel multifunctional polymeric materials combining electrically conducting properties with patterning capability is a significant challenge in materials science. Herein, we report on the synthesis of multifunctional interpenetrating polymer networks (IPN) by the in-situ oxidative polymerization of thiophene-based monomers with $Cu(ClO_4)_2$ inside a novolac-based photoresist. The resulting IPNs show conductivities up to 20 S/cm depending on the monomer properties. Among them, 3,3’’’-Dihexyl-2,2’:5’,2’’:5’’,2’’’-quaterthiophene (DH4T) is chosen because it has the largest conjugation length and excellent solubility in organic solvents. Moreover, it renders a low percolation threshold and smooth surface morphology if compared with terthiophene (3T). FTIR and XPS spectroscopy confirm the DH4T polymerization by $Cu(ClO_4)_2$ and provide some insights about the doping level of the conducting polymer.