

3D electropolymerized thin film based on isoporphyrin and pyridyl-benzene: photoelectrochemical and impedance properties

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Electrogenerated radical cation as well as dication porphyrin using porphyrin such as zinc-5,15-di-p-tolyl porphyrin are powerful electrophiles which can rapidly react with nucleophiles such as dipyrindyl ligand (py-R-py) to form copolymers containing isoporphyrin radical (poly-ZnT₂isoP^{*}) or porphyrin (poly-ZnT₂P) depending of the upper limit potential. [1]

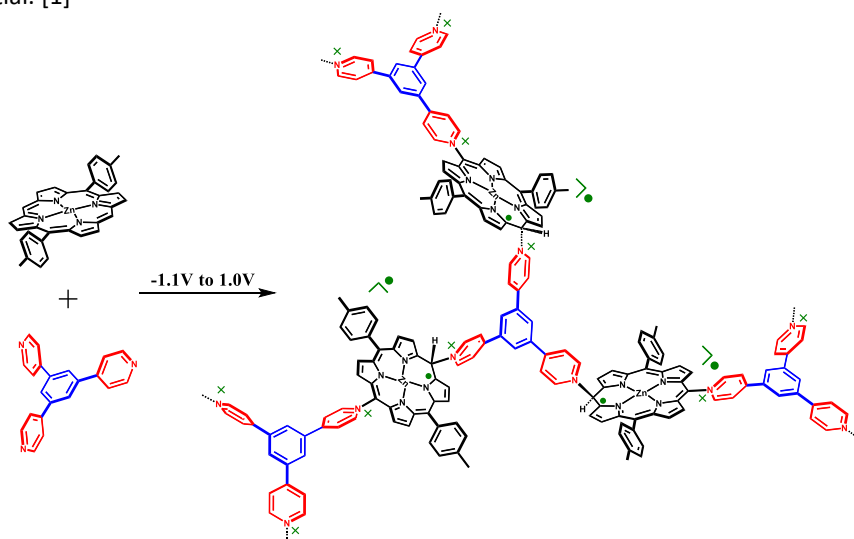


Figure: The electropolymerization process of 3D copolymer

Herein, a series of new 3D hybrid copolymers based on an isoporphyrin has been prepared and studied. The isoporphyrin copolymer thin film was formed by electrooxidation of zinc-5,15-di-p-tolyl porphyrin in the presence of 1,3,5-tri(pyridin-4-yl)benzene or 1,2,4,5-tetra(pyridin-4-yl)benzene. Indeed, the obtained electrogenerated porphyrin radical cation can rapidly react with the pyridyl pendant groups of 1,3,5-tri(pyridin-4-yl)benzene or 1,2,4,5-tetra(pyridin-4-yl)benzene to form 3D copolymer containing stable isoporphyrin. The electropolymerization of the copolymer was monitored by electrochemical quartz crystal microbalance (EQCM). The copolymer was characterized by UV-Vis-NIR spectroscopy, X-ray photoelectron spectroscopy (XPS), electrochemistry, electron spin resonance (ESR) and atomic force microscopy (AFM). The electrical properties have been studied by electrochemical impedance spectroscopy and the photovoltaic performances have been also investigated by photocurrent transient measurements under visible-NIR light irradiation and compared with "classical" linear 2D copolymer containing porphyrins and dipyrindinium spacers. [2]

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