

# ABSTRACT

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New  $\pi$ -conjugated building blocks (unimers) for metallo-supramolecular polymers (MSPs), whose comprise: (i) substituted phosphole ring surrounded by two thiophene rings as the central block, (ii) 2,2':6',2''-terpyridine-4'-yl (*tpy*) end-groups as ion-selectors, and (iii) different linkers inserted between the central block and *tpy* end-groups, are described. Chemical and physical properties of those unimers were studied with attention on correlation between properties and structure of unimers. For example the unimer without linkers shows the UV/vis absorption maximum red shifted about 60 to 100 nm compared to bis(*tpy*)terthiophenes, which proves that replacing of the thiophene with phosphole unit significantly enhances the delocalization of electrons within the unimer molecule and significant area of absorption spectra can be covered. Introduction of linkers (ethynediyl, ethynediyl-thiophene-2,5-diyl, ethynediyl-1,4-phenylene) has a minor effect on the bandgap energy.

All prepared unimers underwent self-assembling process with various metal ions ( $\text{Co}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Ni}^{2+}$  and  $\text{Zn}^{2+}$ ) resulting into metallo-supramolecular polymers. Three stages of the assembly of unimers into related MSPs were observed and characterized by absorption, fluorescence spectroscopy and size exclusion chromatography: 1) formation of dimer species:  $\text{U-M}^{2+}\text{-U}$  (U stands for unimer); 2) prolongation of polymer chain to reach the maximum length at equimolar ratio of unimer and metal ions; 3) end-capping of polymer chains and their partial decomposition at stoichiometric excess of ion couplers. Optoelectronic properties of newly formed metallo-supramolecular polymers were investigated and choice of the metal ions was shown to be of crucial importance.

## Keywords:

Metallo-supramolecular polymers, phosphole, terpyridine, complex stability, unimer