Three Dimensionally-Hyperbranched Fe(II)-based Metallo-Supramolecular Polymer for Electrochromic Application

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Keywords: Metallo-Supramolecular Polymer; Fe(II); Three dimensionally-hyperbranched structure; Electrochromic material

Electrochromic (EC) devices have attracted much attention due to the smart display technology application. The main advantages of metallo-supramolecular polymers (MSPs)-based EC materials to the other EC materials are wide color variation due to the MLCT absorption is adjustable by the combination of the metal and the ligand in the polymers and also show better EC properties.[1] The introduction of a 3D structure to the linear MSP backbone is anticipated to influence the properties like electrochemical, morphology, and thermal stability.[2] The real sun-shading smart window needs a broad range of the visible region absorption.

In this report, three-dimensionally hyperbranched Fe(II)-based metallo-supramolecular polymer(**polyFe-3D**) was one-step synthesized *via* 5:6 complexation of Fe(II) salt, and an asymmetrical ditopic ligand. The coordination ability of Fe(II) ion to the two different binding sites of **L** was confirmed by the ultraviolet-visible (UV/Vis) titration. The molecular weight of the polymer (M = 3.96 × 10^5 Da) was confirmed by a size-exclusion chromatography-viscometry experiment. The absorption spectrum of **polyFe-3D** has covered a wide visible region from 430 nm to 640 nm. Cyclic voltammogram of **polyFe-3D** showed a single reversible redox wave of the Fe(II)/Fe(III) couple (E= 0.74 V). **PolyFe-3D** showed magenta color-to-pale green color electrochromic behavior with good coloration and bleaching times, high coloration efficiency, and switching stabilities and we also fabricated a solid-state electrochromic device (Figure 1).

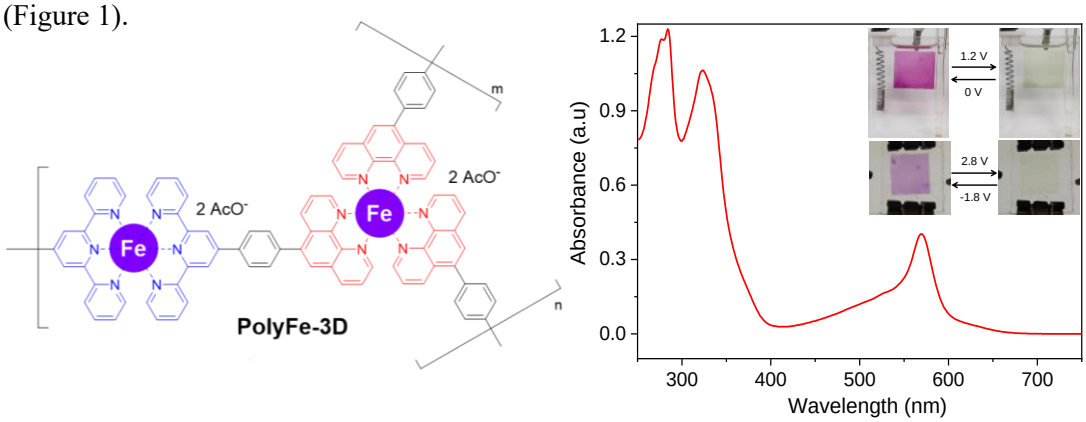

Figure 1. The chemical structure, absorption spectrum, and EC properties of **PolyFe-3D.**

1) M. Higuchi, *J. Mater. Chem. C*, **2014**, *2*, 9331.
2) C.-W. Hu et al. *ACS Appl. Mater. Interfaces*, **2014**, *6*, 9118.

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