

Photoinduced Electrochromism of Conducting Polyaniline and Its Application

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We have already reported that photopolymerization of aniline (An) derivatives is carried out by vis. illumination to the bilayer electrode composed of $\text{Ru}(\text{bpy})_3^{2+}$ incorporated Nafion film and PSiO-MV^{2+} film. Since the Nafion composite film contained photoinduced electron transfer system, such a photoinduced electron transfer would be also applied to the oxidation or reduction reaction of the reduced or oxidized state of polyaniline (PAn) to realize the formation or erasing of an image, respectively.¹⁻⁴⁾

In this paper, we showed that the photorewritable conducting PAn image was obtained by the photopolymerization of An derivatives on polyelectrolyte composite film containing $\text{Ru}(\text{bpy})_3^{2+}$ and TiO_2 (Fig.1). The image can be erased and regenerated by consecutive photoreduction and photooxidation via photoinduced electron transfer with $\text{Ru}(\text{bpy})_3^{2+}$ and TiO_2 . When these photooxidation and photoreduction were carried out in the reaction solution bubbling O_2 and N_2 respectively, good reversibility was obtained on the present system. However, decomposition of PAn was observed by excessive photooxidation because of the hydrolysis of the imine bond of the PAn. In order to prevent the decomposition of the PAn, photoredox reaction of the PAn composite film was investigated in dichloroethane containing CF_3COOH . As the result, improved photoreduction efficiency as well as no decomposition reaction of the PAn composite film was achieved (Fig.2).

The electronic state of the present PAn can be varied by photoillumination as shown above. The conductivity of the PAn image should be, therefore, varied by the photoillumination. Fig. 3 clearly showed that the conductivity of the PAn (B) synchronized with the absorption spectrum (A) of photopolymerization (a), photoreduction (b) and photo-reoxidation (c).

References

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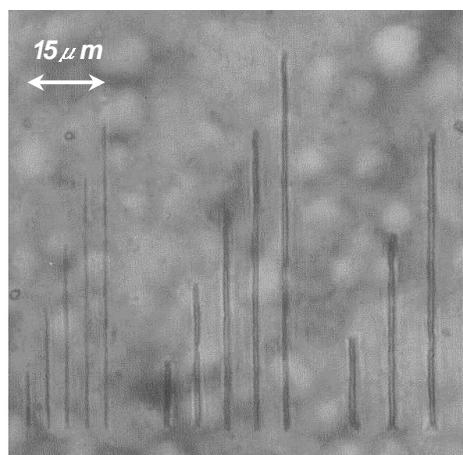


Fig.1 Micropattern of photopolymerized polyaniline.

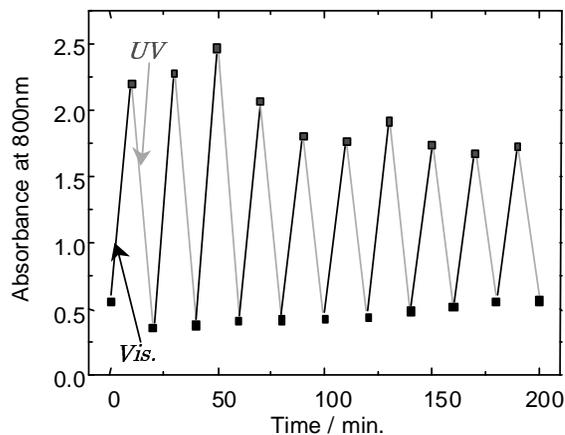


Fig.2 Time course of absorbance changes at 800 nm induced by photooxidation and photoreduction for the composite film in 1,2-Dichloroethane solution containing 1M CF_3COOH and 10vol.% MeOH..

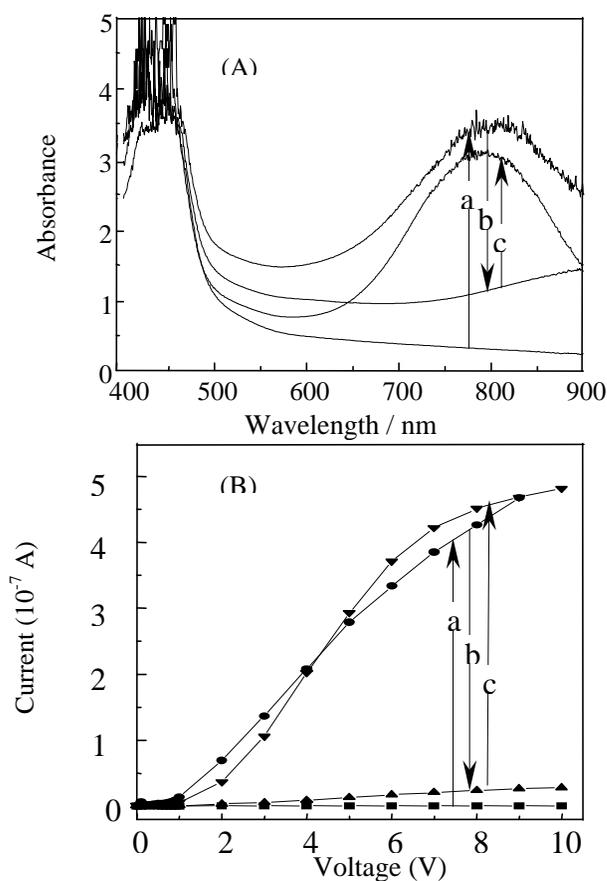


Fig.3 The changes in absorption spectrum (A) and I-V curve (B) of the photopolymerized PAn film upon photoredox reaction.