Synthesis of polyacetylene chloride conducting polymer by using an electropolymerization

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Introduction

Acetylene chloride is an interesting material due to a large number of overtone and combination bands showing assignable vibration-rotation structure. The pure rotational spectrum of acetylene chloride has been examined, with the most recent study being that of Le Guennec *et al.* who cite the previous spectroscopic work [1-3]. It has been reported for many years that a very long linear conjugated polyene might have various interesting properties such as optical, electrical and magnetic characteristics [4]. A polyene is an even number of methyne groups, covalently bonded to form a linear carbon chain bearing on pi-electron on each carbon atom [4]. An alternating conjugated system is a polymer produced from a carbon-carbon triple bonds or with cumulated double bonds [5]. In this study, we propose an acetylene chloride as monomer to synthesize a novel polymer which had conjugated and electrical properties of polyacetylene chloride.

Experimental

The graphite stick (1×6×0.3 cm, ED-11 model) purchased from Center Carbon Company, Taiwan, was cut and the deposited area 1.5 cm^2 was controlled by parafilm tape. The graphite stick was used as substrate for electrodeposition of Pb. The working electrode was ultrasonically cleaned in 0.1 M HNO_3 aqueous solution, then washing with deionized (DI) water thoroughly. Next, the graphite stick substrate was immersed in the electrodeposited Pb aqueous solution containing 0.63 M $Pb(BF_4)_2$, 0.68 M HBF_4, 0.43 M H_3BO_3, and 0.0006 M PEG300. Finally, the electrodeposition of Pb for prepared the working electrode was carried out at a desired operating condition and electrolyte composition.

Results and discussion

Effect of TBAT electrolyte concentration on the amount of polyacetylene chloride is shown in Figure 1. The result shows that increasing the TBAT electrolyte concentration from 2.5 to 5.0 mM, increases the amount of polyacetylene chloride from 1.4 to 10.6 mg. However, increasing the TBAT electrolyte concentration from 5.0 to 10.0 mM, decreases the amount of polyacetylene chloride from 10.6 to 1.8 mg. Consequently, the 5.0 mM TBAT is chosen as the electrolyte concentration for this system.

The cyclic-voltammograms of electrodeposited Pb modified electrode with and without acetylene chloride in the 0.01 M TBAT organic electrolyte are shown in Figure 2. The results show that the main reduction peak appears at -1.8 V (vs. Ag/Ag^+). It may be explained that the reduction of acetylene chloride was occurred on the surface of electrodeposited Pb modified electrode with an organic electrolyte.

References

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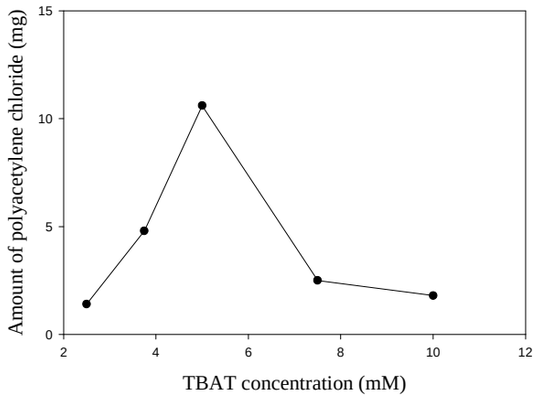

Figure 1. Effect of TBAT electrolyte concentration on the amount of polyacetylene chloride.

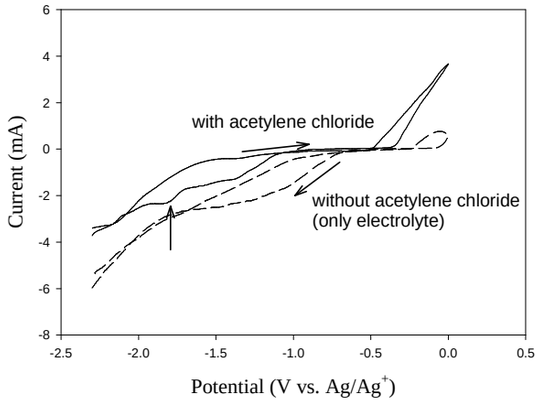

Figure 2. The cyclic-voltammogram of acetylene chloride.