C-3 Influence of Redox Potential and Current Density on Polarization Curves with Polymer (polypropylene)

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1. Introduction

Natural polymers are the basis of all life processes, and our technological society is largely depend on synthetic polymers (Chang, 1994; Brydson, 1995). Undoubtedly the 1970s will similarly be known as the environmental, ecological, or pollution decade, for it is in this decade that environmental pollution has become a popular cause for concern. Much of the material spoken and written about environmental pollution has been presented with great emotion from a position firmly on one side or the other of the issues(Stocker, 1972). But, the corrosion of polymers has not been previously reported. So that, this paper is our first attempt to correlate corrosion tests executed by electrochemical method. In this study, we have also determined the detailed influence of variation factors such as temperature and pH. Also, we obtained corrosion effect of the salt.

2. Experimental

Polypropylene obtained from Aldrich Chemical Company, Inc. Electrochemical and polarizing measurements were performed toluene or dimethylformamide. The supporting electrolytes was tetrabutylammoniumperchlorate(TBAP) (G.F.S.Chem -icals), or lithium percholrate(Aldrich), which was used as received. The supporting electrolyte concentration was typically 0.1M. The electrode tip of a working electrode system may consist of a $1cm^2$ silver piece in area(thickness 0.1mm) of conducting material, which together with a silver wire for electrical conduct is sealed perpendicular to the rod(wire) axis. The reference electrode get used to the saturated calomel electrode(Ag/AgCl: KOSLOW SCIENTIFIC COMPANY. P/N 1004), and graphite carbon rod was used as a counter electrode and electrolysis cells were of conventional design. Solutions for electrochemistry were typical 1mM in the redox-active species, and were deoxygenated by purging with prepurified nitrogen for

at least 8 min. All experiments were performed at a scan rate of 7mV/s by CMS100 and 105(Gamy Instruments, Inc) with a computer. The pH was measured with pH meter(ORION model 960) conductance was measured with a ORION model 142. Tafel plots were obtained from -1.0 to +1.5 V region at the steady state potential. The pH of the solution was controlled by sodium hydroxide or formic acid. It was added to magnesium chloride in order to observation an effects of salt.

3. Results and Discussion

3.1 Electrochemical Polarization Characteristic of pH and Temperature.

The Fig.1 shows the electrochemical polarization curves of polypropylene in nonaqueous solvent (toluene or dimethylformamide). Corrosion tests were carried out to determine qualitatively the effects of several variables on the corrosion in 0.1M polypropylene. The Fig. 1 shows the effect of pH on anodic polarization of 0.1M polypropylene at 30℃. The solution was air saturated and on atmosphere of air filled the free space of the autoclave at room temperature(Do, 1992).

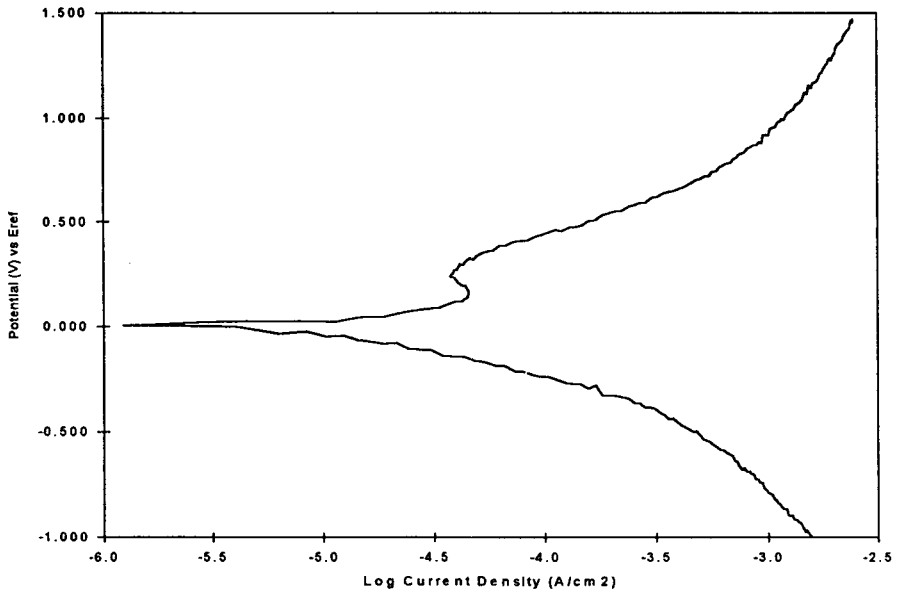

Fig. 1. Polarization curves of polypropylene in nonaqueous solvent (contained dissolving oxygen on pH=3.0 a 30℃).

4. Conclusion

The corrosion polarization curves of 0.1M polyproplyene exhibits a total of two oxidation. The potential efficiency of the 1st and 2nd waves were kept for the anodic oxidation potential at all temperatures. The best corrosion temperature efficiency was

at 30℃ to 35℃ and corrosion pH efficiency was near at pH 3.0.

The best condition of pH and temperature for corrosion rate was found to be pH 3.0 in acidity 30℃. The resistance effect of temperature and pH were speculated that it was decreased the gradual minimum at temperature.

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