Affecting of Corrosion Potential and Current Density on Variation Polarization Curves with Polyvinylchloride [Ⅱ]

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1. Introduction

Natural polymers are the basis of all life processes, and our technological society is largely depend on synthesis polymers[1,2]. The 1960s is known to some as the space decade. 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 oneside or the other of the issues[3]. But, the corrosion of polymer's has not been previously reported. So that, this papar is our first attempt to correlate corrosion tests executed by electrochemical method. In this study we have also determined the detailed influence of variation factor's (temperature and pH). Also, we were obtained corrosion affect of the enzyme[4] and salt.

2. Experimental

Polyvinylchloride was obtained from Mu-Dung corporation in Kwang Ju. The working electrode, cast in solution to expose a all side shaped face of 1cm², is on way end with platinum line. The reference electrode was calomel electrode (silver/silver chloride) and counter electrode was graphite carbon rod. The corrosion polarization measurements was carried out under a nitrogen atmosphere (on the sample solution). All experiments were performed at a scan rate of 10 mV/sec by CMS 100 and 105 (Gamry Instruments, Inc) interface with a computer. The test of pH was measured by pH meter(ORION 960). Tafel plots were obtained from -2.0 to +3.0 V region at the steady state potential. While vinylchloride content was maintained at 10^3 mol, and the pH of the solution were controlled by sodium hydroxide or sulfuric acid. In order to observe the effects of salt was added to sodium chloride. A enzyme(lipase : Aldrich, grade reagent) dissolve at a concentration of mg/mℓ(unit) in nonaqueous.

3. Results and Discussion

3.1. Electrochemical Polarization Characteristic of Salts
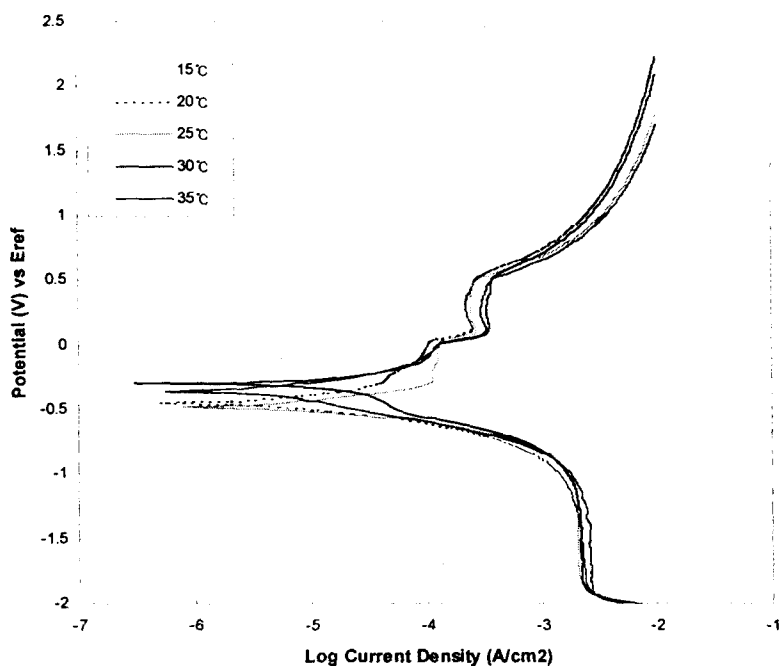

Fig 1. Polarization curves of vinylchloride at temperature in 0.1M-NaCl.

Fig.1 shows the electrochemical polarization curve of polyvinylchloride containg (tetrahydrofuran + dimethylforamide (80 : 20)) dissolved oxygen in air.

Corrosion tests were carried out to determine qualitatively the effects of several variables on the corrosion of polyvinylchloride in 0.1M sodium chloride solution. Fig.1. shows the effect of temperature on cathodic and anodic polarization of polyvinylchloride in 0.1M NaCl. The solution was air saturated and one atmosphere of air filled the free space of the autoclave at room temperature[5].

3.2. Effect of Temperature for corrosion

As shown in Fig.2 with polyvinylchloride, and the potential efficiency of the 1st-wave was exhibited to cathodic reduction potential when the 2nd and 3rd-waves were kept for the anodic oxidation potential at all temperatures. For curve 2nd and 3rd-waves where corrosion occurred, oxygen was consumed, 1st wave of the cathodic reaction consisted of the reduction of hydrogen ions to hydrogen in air. The corrosion efficiency increased at 35℃ when corrosion leads to an decrease with according to

increasing temperature (to 15℃ till 30). The temperature series of corrosion tests from 2nd and 3rd waves indicated that potential higher than oxidation from 15 to 20 and 35℃ but the corrosion did occur lower than potential (0.01V) when it was at the 25 and 30℃. And so, the best corrosion temperature efficiency was at 25 to 30℃.
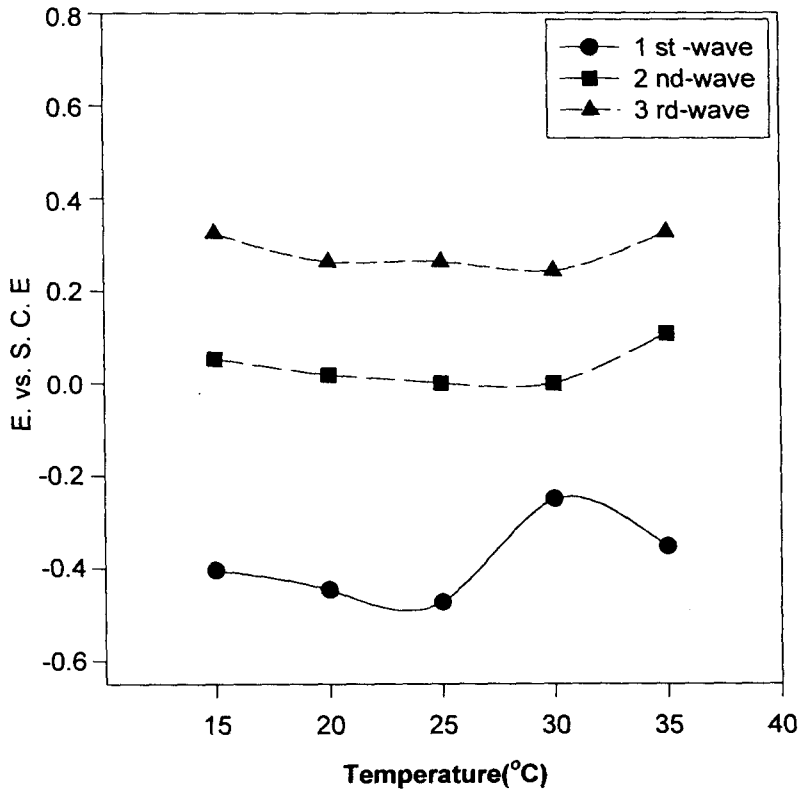

Fig 2. Variation of corrosion potential on temperature efficiency in 0.1M -NaCl solution.

4. Abstract

In this study, we was carried out the experiments for measuring the variations of corrosion potential and current density for polarization curves with polyvinylchloride. The results were examined to find out especially the influence affecting the corrosion potential and vary condition (temperature, pH, enzyme, and added salt). The lines representing active anodic dissolution were shift only slightly in the noble potential direction by temperature, pH, enzyme, and salt. Tafel slope for anodic dissolution

could be determined because of polarization effect to vary condition. Line slope of the polarization curves describing the active-to-passive transition region was shifted noticeably in the noble direction. Also, from the variation of conditions, we are speculated a best of conditions which it most readily transforms (temperature, pH, corrosion rate, and resistance of corrosion potential). The second anodic current density peak and maximum passive current density are designated degradation(I_P/I_0). The value of I_P/I_0 is used as a measurement for the extent of degradation of the polyvinylchloride. The potentiodynamics parameter of the corrosion was obtained using Tafel plot.

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