DETERMINATION OF THERMODYNAMIC PROPERTIES OF POLY 2-(3-METHYL-3-PHENYLCYCLOBUTYL)-2-HYDROXYETHYL METHACRYLATE-CO-METHACRYLIC ACID BY USING INVERSE GAS CHROMATOGRAPHY

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The inverse gas chromatography (IGC) method has been used extensively to study the structure of polymers, the interactions of various liquids and gases with polymeric materials and to investigate polymer-polymer miscibility. The method is simple, fast, economical and provides valuable thermodynamic information for characterization of polymeric materials.

In this study chromosorb W DMCS (60-80 mesh) covered with 10% poly 2-(3-methyl-3-phenylcyclobutyl)-2-hydroxyethylmethacrylate-co-methacrylic acid (PCHEMA-co-MA) which has a molecular weight ranging 45,000 was filled in a spiral glass column having a length of 2.1 meters and an internal diameter of 3.2 mm. The column was conditioned in a gas chromatograph (Shimadzu GC 14B) at 80°C under nitrogen flow (20 mL/min) 24 h. Then methanol, ethanol, acetone, E.M.K, methyl acetate, ethyl acetate, benzene, toluene, o-xylene, n-octane, n-nonane, n-decane, n-undecane and n-dodecane were injected as probes at temperatures of 120-160°C and their retention times and their specific retention volumes ($V_g^0$) were determined.

From these calculated $V_g^0$, some thermodynamic quantities were obtained for the interactions of (PCHEMA-co-MA) with alcohols, ketones, acetates, aromatics and n-alkanes by inverse gas chromatography method in the temperature range (120-160°C). The specific retention volumes ($V_g^0$), weight fraction activity coefficients of solute probes at infinite dilution ($\Omega_{1^w}$), Flory-Huggins thermodynamic interaction parameters ($\chi_{12}^w$) between polymers and solvents are determined. The partial molar free energy ($\Delta G_{1^w}$), the partial molar heat of mixing ($\Delta H_{1^w}$) at infinite dilution and the solubility parameters of polymer ($\delta_2$) were calculated.