

PC 15

POLARITY OF POLY(*N*-ISOPROPYLACRYLAMIDE) AND POLY(*N,N*-DIETHYLACRYLAMIDE) GELS AND THEIR TEMPERATURE-DEPENDENT PROPERTIES STUDIED BY LIQUID CHROMATOGRAPHY

J. Hradil, H. Macková, D. Horák

Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Heyrovského nám. 2, CZ-162 06 Praha 6, Czech Republic (hradil@imc.cas.cz, <http://www.imc.cas.cz>)

Environmentally sensitive hydrogels have an enormous potential in various applications¹. Thermoresponsive polymers including poly(*N*-isopropylacrylamide) (PNIPAAm) and poly(*N,N*-diethylacrylamide) (PDEAAm) change swelling with temperature².

The aim of our investigation was to determine, by LC, changes in polarity of PNIPAAm and PDEAAm gels and in sorption of biopolymers with temperature. The retention of solutes in the PNIPAAm gel crosslinked with 1 wt. % of *N,N'*-methylenebisacrylamide decreased with increasing temperature; a jump change was observed at 35 °C. The dependence of the solute retention volume on the Taft σ^* constants confirmed a decrease in polarity with temperature.

The determined values of Gibbs energy changes (ΔG_{CH_2}) were rather low - 2.41 kcal/mol for PNIPAAm and 1.08 kcal/mol for PDEAAm. Gibbs energy of the interactions increased in the order:

phenol < benzyl alcohol < ethanol < butan-1-ol.

The highest energy of butan-1-ol - polymer interaction confirmed a rather nonpolar character of the polymers. Protein and dextrans exhibited higher retention volumes at 40 °C than at 22 °C confirming thus hydrophobic interactions of these compounds with PNIPAAm. A drawback of these temperature-sensitive hydrogels consists in their slow response.

Financial support of the Grant Agency of the Academy of Sciences of the Czech Republic, project KAN 200200651, is gratefully acknowledged.

1. Y. Qiu and K. Park, *Adv. Drug Delivery Rev.* 53, 321-339, 2001.
2. V. Kůdela, J. Vacík, J. Kopeček, *Eur. Polym. J.* 13, 811-813, 1977.