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Two – scale – factor universality of binary liquid critical mixture condensed matter, liquid binary mixtures

Issam Rashid Abdelraziq and Balsam Nader Ata
An-Najah University, Palestine

The dynamic shear viscosity of a binary liquid mixture phenol – water has been measured at different temperatures and concentrations. The critical temperature T_c and critical concentration are found to be 67.0°C and 33.90% by weight of phenol respectively, the critical density ρ_c is measured to be 0.8952 gm/cm^3.The critical and background amplitudes of specific heat at constant pressure are calculated to be 78.117 J/kg.K and 85.292 J/kg.K respectively. The pressure derivative of the critical temperature along the critical line T_c is calculated to be 9.722 ×10^{-6} K/Pa. The dynamic shear viscosity of binary liquid mixture phenol – cyclohexane has been measured at different temperatures and concentrations. The critical temperature T_c and critical concentration are found to be 17.0 °C and 2.70% by weight of phenol respectively. The critical density ρ_c is measured to be 0.7627 gm/cm^3.The critical and background amplitudes of isobaric thermal expansion coefficient α_{pc} and α_{pb}, are calculated to be 4×10^{-6} K^{-1}, 6×10^{-4} K^{-1} respectively. The pressure derivative of the critical temperature x_c for the binary is calculated to be 1.083 ×10-8 K/Pa. The universal quantity$R^+\xi$ of both binary liquid critical mixtures phenol – water and phenol – cyclohexane are calculated to be 0.2716and 0.2699 respectively. The values are in a good agreement with the theoretical value of $R^+\zeta$. The two binary liquid critical mixtures belong to the class of universality "Two – Scale – Factor Universality".

Biography

Issam Abdelraziq is a Physics graduate program coordinator at An-Najah University, Palestine.

ashqer@najah.edu

Critical behavior of the ultrasonic attenuation for the binary mixture of water – phenol condensed matter, liquid binary mixtures

IssamAbdelraziq, Maryam Reehan and Mohammad Abu-Jafar
An-Najah National University, Palestine

The dynamic shear viscosity of the binary liquid mixture water – phenol was measured for different temperatures and concentrations using the glass capillary and digital viscometers. Dynamic shear viscosity anomaly was detected near the critical temperature = 67 °C and the critical concentration x_c= 33.9% by weight of phenol. The specific heat at constant pressure was calculated using the two scale factor universality and found to be 241.9 $\frac{J}{kgK}$. The critical and the background isobaric thermal expansion coefficients were determined and found to be 2.729 x10-3 °C^{-1} and 22.59 x10-3 °C^{-1} respectively. Ultrasonic attenuation data at 9, 15, 30 and 35 MHz were analyzed using the dynamic scaling theory of Ferrell and Bhattacharjee. The values of $\frac{\alpha_c}{f^2}$ versus $f^{-1.06}$ yield a straight line as predicted by the theory. The experimental values of $\frac{\alpha(x_c,T)}{\alpha_c(x_c,T_c)}$ for water – phenol were compared to the scaling function F($\omega^{*'}$) and showed good agreement with the theory.

Biography

Issam Abdelraziq is Physics graduate program coordinator at An Najah University, Palestine.

ashqer@najah.edu