Tricritical Behavior of C24 Normal Alkane Heat Capacity Near R_I -R_{II} Phase Transition

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Recently the five rotator phases in the normal alkanes C20 - C30 have been identified by X-ray scattering measurements [1]. It was established that these phases are complex layered structures with in-layer order similar to that observed in highly ordered smectics. C24 is the most preferable normal alkane for the R_I - R_{II} phase transition investigation which has a rather wide temperature region of the experimental data for fitting to a theoretical model. Our measurements of heat capacity and enthalpy have shown that R_I - R_{II} phase transition in C24 is very close to the tricritical point. It is confirmed by the shape of the heat capacity anomaly that looks very similar to the mean-field tricritical behavior. Fitting of the experimental data on the heat capacity for $T < T_c$ to the expression

$$C_p = A(T + t_o)^{-\alpha} + Bt + C,$$

gives the tricritical exponent $\alpha = 0.5 \pm 0.05$ and a very small value of the transition temperature shift $t_o = 3.5 \cdot 10^{-5}$ (t_o is the reduced distance from the transition point). The possible models describing tricritical behavior of heat capacity near R_I - R_{II} phase transition are discussed.

[1] E.B. Sirota, H.E. King, Jr., D.M. Singer, and H.H. Shao. *J. Chem. Phys.* **98**, 5809 (1993).

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