

Thermodynamic Properties of a Dissociating Liquid in the Critical Region

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The applicability of the scaling theory for describing thermodynamic properties of chemically reacting fluids in the vicinity of the critical point has been studied. Such fluids, e.g. nitrogen dioxide, exist as a dissociating system at the phase transition parameters, and the degree of dissociation in the liquid phase, in a state of chemical and thermodynamic equilibrium with its vapor, differs from that in the vapor phase. At the same time, this system is a mono-variant one, and has a single isolated critical point. The exponential functions are also valid. Further analysis shows that the asymptotic behavior of thermodynamic functions in the critical region for nitrogen dioxide can be described within the frame of theoretical models applicable for pure substances. On the other hand, it can be shown that the non-asymptotic correction terms in the scaling equation of state differ from those for pure substances. The results of experimental studies and the expanded equations describing thermodynamic properties of nitrogen dioxide along its phase transition curve in a wide critical region are presented. The re-normalization region of critical indexes and critical point curve parameters has been estimated for thermodynamic properties of the nitrogen dioxide-nitrogen oxide mixture. Re-normalization of the isobaric heat capacity critical index for this mixture in the liquid-gas critical region has been experimentally examined.