

# **A New Group Contribution Multi-Fluid Nonrandom Lattice Fluid Equation of State and Application to High Pressure Phase Equilibria**

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The recently proposed multi-fluid nonrandom lattice fluid (MF-NLF) model was used to propose a method for estimating the equation of state (EOS) parameters using a group contribution (GC) scheme. The group parameters consist of close packed volume and segment number parameters and temperature dependent energy interaction parameters. To reliably reproduce equilibrium data near the critical region a new contribution based on Veytsman statistics was introduced into the EOS framework to account for long range density fluctuations, which are known to induce molecular clustering near the critical region. The probability of clustering is modified to be dominant in the critical region. The combination of the GC parameter estimation method and the modified Veytsman contribution were evaluated for various pure and binary equilibrium systems over a wide temperature and pressure range. The results show a remarkable agreement with the presented experimental data, even in temperature and pressure regions near the critical point.