Renormalization group correctioins to a modified perturbed hard sphere chain equation of state
for simple fluids near to and far from the critical region

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Thermodynamic properties in the near critical region are of much interest in a variety of chemical industrial processes, noticeably for supercritical extraction and fractionation of petroleum. The development of accurate prediction tools is a significant factor for the optimum design of these processes.

Classical equations of state (EOSs) can describe well the thermodynamic properties of fluid far from the critical point with a single set of parameters. However, these EOSs provide poor descriptions of fluid in the near critical region with the same set of parameters.

To predict the thermodynamic properties over the entire fluid region, we modified Perturbed Hard Sphere Chain (PHSC) EOS and applied Renormarlization group (RG) theory which has proven to describe the fluid properties near critical region. The results of combining modified PHSC with RG theory provide good agreement with vapor liquid equilibrium and surface tension experimental data for n−alkane fluids.