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The associating lattice gas in the presence of interacting solutes

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We have investigated the phase diagram of a statistical model for hydrogen-bonding solutions for polar solutes. The structured solvent is represented by an associating lattice gas, which presents anomalous density and liquid-liquid coexistence. Polar solute particles and solvent particles interact attractively, while the solvent-solvent interaction is made directional through bonding arms, which mimic hydrogen bonds. The model behavior is obtained via Monte Carlo simulations in the grand-canonical ensemble, for different sets of parameters. For small solute chemical potential and weak attraction between solute and solvent particles, addition of solute yields a shift in the transition lines of the pure solvent. This is the scenario explored by different authors, in the pursuit of stabilizing the water liquid-liquid coexistence line. However, as we show, in the case of larger solute chemical potentials, or of stronger solute-solvent attractions, new phases may arise.

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