Two corresponding-states forms have been developed for direct correlation function integrals in liquids to represent pressure effects on the volume of ionic liquids over wide ranges of temperature and pressure. The correlations can be analytically integrated from a chosen reference density to provide a full equation of state for ionic liquids over reduced densities from 1.5 to more than 3.6. One approach is empirical with 3 parameters, the other is a 2-parameter theoretical form which is directly connected to a method for predicting gas solubilities in ionic liquids. Parameters for both methods have been obtained for 28 different ionic liquid systems by reduction of carefully validated P\(\rho\)T data. The results show excellent agreement with the experimental data for nearly all substances over all ranges of conditions. Group contributions to parameters are also explored, leading to an entirely predictive method for ambient pressure densities and densities of compressed ionic liquids. Extensive comparisons are made with other techniques.

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