The State of the Art in Entropy Scaling Applied To Transport Property Modeling

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The entropy scaling paradigm, introduced by Rosenfeld in 1977 to little fanfare, has in recent years been shown to be a very powerful semi-empirical technique for linking the thermodynamics and transport properties (viscosity, thermal conductivity, and diffusivity). The technique was first applied to modeling the properties of Lennard-Jones and inverse-power-law fluids based on the very limited data available at the time. Since then, the use of entropy scaling approaches has expanded, and the transport propeties of certain classes of fluids (non-associating and non-quantum) have been shown to be very accurately modeled by this approach. In some cases, generalized predictive schemes can approach the accuracy of correlations developed for particular fluids. The origins of the scaling approaches have links back to the theory, and new observations arise from thinking in an entropy-scaling-based way.

There are numerous challenges in the application of entropy scaling where additional theoretical investigation is required, so a key element of this talk is to identify when we should *not* expect entropy scaling to be successful. In attempting to address those points, it is hoped that new physics will be discovered, as was the case for quantum-influenced systems as one example.