

## **An Overview of Viscosity Data Correlations Derived from Symbolic Regression**

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Viscosity data correlation for compounds where data are available over a wide range of both temperature and pressure covering the liquid, gas and super-critical fluid phases is an important and difficult area of research. Attempts have been made to develop precision, compound specific correlations for many fluids that satisfy the data requirements. It has proven to be challenging to reproduce the variation in viscosity over the entire data range. Except for very limited regions of phase space where the kinetic theory of gases is applicable, these correlations are generally created empirically and are quite complex. We will present a new approach based on symbolic regression for discovering a simpler empirical functional form that has comparable performance to more complex current correlations. The technique of symbolic regression allows for the exploration of functional forms for data fitting as a function of complexity and fitting accuracy and thus, by making trade-offs between simplicity and accuracy of fit, permits one to find relatively simple forms that fit the vast majority of data. This technique will be described and its application to the correlation of the viscosity data for several different fluids will be detailed. In each case the final form chosen from symbolic regression is subsequently optimized using traditional, non-linear optimization techniques. The optimized forms will be presented and their performance relative to other correlations will be discussed. Finally, a comparison of functional forms produced across all compounds will be presented with similarities and differences noted.