The Thermal Diffusion Factor of the van der Waals Binary Mixture

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The explicit dependence of the thermal diffusion factor with respect to the composition and the interaction parameters for the van der Waals binary mixture is obtained in the framework of the mean-field kinetic variational theory and in the scheme of Scott and van Konynenburg. Explicit formulas for the thermal diffusion factor of the van der Waals mixture and a procedure to estimate it in the ninth Sonine approximation are obtained. In addition, we present a numerical study where the global behavior of the thermal diffusion factor is described in terms of molecular masses, sizes, and interaction parameters, along the phase diagram of this model mixture. This numerical study allows us to understand what molecular parameters modify the sign of the thermal diffusion factor. Also, a comparison is made between the thermal diffusion factor coming from the van der Waals mixture and from the hard-sphere mixture. This method can be used to correlate the thermal diffusion factors of actual mixtures; some examples are shown here.