A Note on the Composition Dependence of the Thermal Diffusion Factor of Ar–He System

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The thermal diffusion factor \( \alpha_T \), for the Ar–He system is measured for a mixture containing 18.9\% He in a two-bulb apparatus with its hot and cold bulbs at temperatures 78.5 and \(-196.3^\circ C\), respectively. The \( \alpha_T \) value referring to \(-135.8^\circ C\) is 0.287. Experimental results are compared with the CHAPMAN–ENSKOG theory and the exp-six potential.

There is some special interest in the experimental and theoretical studies of the composition dependence of thermal diffusion factor, \( \alpha_T \). The point can be elaborated by casting the expression for \( \alpha_T \) in the following familiar form:

\[
\alpha_T = (6C^*-5)g.
\]

The "g" factor is a complicated function of different quantities \(^1\) but is very feebly dependent on temperature \(^2\). Thus, by \( \alpha_T \) measurements as a function of temperature one can adjust for a reasonable potential, its parameters such that the temperature dependence is explained. The real test of theory and potential therefore consists in its ability to reproduce the composition dependence. Here also a critical examination reveals that the "g" factor is only weakly dependent on the choice of potential. Consequently \( \alpha_T \) variation with composition offers a good check for the test of theory.

Here, we report our study for the Ar–He system on the same apparatus as used by MATHUR and SAXENA \(^3\).

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8 S. C. SAXENA and B. P. MATHUR, Rev. Mod. Phys. 37, 316 [1965].