

ABSTRACTS OF PAPERS Not Published in This Report

A Structural Model for Monatomic Liquids including Metallic Liquids*

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Abstract

Under criticism of the data of atomic radial distribution curves for eighteen monatomic liquids, a simple reduced-type structural model of liquids near their melting points having only one parameter A , which is the residual molecular diameter subtracted twice the root-mean-square amplitude of molecular vibration from the mean intermolecular distance r_1 , is proposed as follows: "Let V_0 be the volume at closest packing of spherical molecules of diameter A , then the volume of liquid at T_m is $1.5 V_0$ for quasi face-centred cubic lattice. But about 10 per cent of the sites in this quasi-lattice are empty, and these spaces are distributed through all interstices explaining the second peak at $1.9 r_1$ of the distribution curves. Thus the total volume is about $1.65 V_0$."

Combining this model with the free volume theory several molecular properties of monatomic van der Waals and metallic liquids including spherico-symmetrical molecular liquids are explained; for example, the shapes and positions of 1st and 2nd peaks in the radial distribution curves, the entropies, the self-diffusion coefficients and the viscosity coefficients at their melting points.

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