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① — THE REDUCED DYNAMIC (ABSOLUTE) AND KINEMATIC VISCOSITIES OF THE METALS—MERCURY, SODIUM AND POTASSIUM—OVER THEIR ENTIRE LIQUID RANGE, i.e., FROM THE MELTING POINT TO THE CRITICAL POINT, AND A COMPARISON WITH VAN DER WAALS' SUBSTANCES*

melting ⑥

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Abstract—Recently it has been possible to estimate both the dynamic (absolute) and kinematic viscosities of three metals—mercury, potassium and sodium—over their entire liquid temperature range from experimental data and the use of da C. ANDRADE'S II equation and the law of hyperbolic diameter. The reduced viscosities of the three metals, both dynamic and kinematic, ν_{red} , are derived and compared with the same functions for van der Waals's substances. It is demonstrated that the three liquid metals (and presumably other metals) behave quite differently from van der Waals substances. It is also shown that the behaviour of mercury, as described in the literature, is contrary to present day factual knowledge.

WE have recently been able, as part of our high temperature research program, to estimate the viscosities of the three metals—mercury,⁽¹⁾ sodium and potassium,⁽²⁾ both dynamic and kinematic,⁽³⁾ over their *entire liquid temperature range*—from the melting point to the critical point. In connection with our high temperature containment of liquids,^(4,5) we are particularly interested in the properties of liquid metals and their vapours *along the saturation line* all the way from the melting point to the critical point. Thus, in the references (1), (2) and (3), the viscosities of the *saturated vapours* of the three metals are included.

In order to apply the new knowledge gained with these three metals to other metals, it is advisable to apply to them the law of corresponding states and express these properties in terms of reduced variables, i.e., the reduced dynamic viscosity, η_{red} ,

$$\eta_{red} = \eta / \eta_{crit.}$$

reduced kinematic viscosity, ν_{red} ,

$$\nu_{red} = \nu / \nu_{crit.}$$

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⁽¹⁾ A. V. GROSSE, *J. Phys. Chem.* **68**, 3419 (1964).

⁽²⁾ A. V. GROSSE, *Science*, March (1965).

⁽³⁾ A. V. GROSSE, *J. Phys. Chem.*, Submitted for publication, Oct. (1964).

⁽⁴⁾ A. V. GROSSE, *The Liquid Range of Metals and Some of Their Physical Properties at High Temperatures*, Research Institute of Temple University, Philadelphia, Pa., Report of September 5, 1960.

⁽⁵⁾ A. V. GROSSE, *Science*, **140**, 781-89 (1963).