Optic-like collective excitations and some rigorous relations for transport coefficients in mixtures: the molten salts case

Ihor Mryglod

Institute for Condensed Matter Physics of the National Academy of Sciences of Ukraine, Lviv, Ukraine

mryglod@icmp.lviv.ua

Concept of collective excitations has played an important role in dynamics of many-particle systems. In this report within general formalism, developed for the study of collective behavior in liquids, we consider several models of liquids, starting from the simplest liquid mixtures and up to ionic melts. The main emphasis is done on the problem of optic phonon-like excitations in liquid mixtures. Collective dynamic variables, possessing the properties of normal coordinates, could be defined rigorously for a general case of a multi-component mixture. The theory is applied for a comparative study of binary fluids of neutral and charged particles. Specific features in the collective behavior of ionic liquids, caused by the Coulomb interactions, are discussed. Another issue of this study is transport phenomena in molten salts. In particular, it is shown that so-called "universal golden rule", formulated empirically by Sundheim for partial conductivities of binary charge-symmetric molten salts more than 60 years ago, can be derived rigorously. Furthermore, it is demonstrated that this relation has to consider as an example of a wider class of explicit identities for generalized transport coefficients valid for a multi-component mixture.