Thermodynamics and Structure of Liquid Metals from a New Consistent Optimized Random Phase Approximation

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   We study thermodynamics and structural properties of several liquid metals to assess the validity of the generalized non-local model potential (GNMP) of Li et al. [J. Phys. **F16**, 309 (1986)].
   By using a new thermodynamically consistent version of the optimized random phase approximation (ORPA), especially adapted to continuous reference potentials, we improve our previous results obtained within the variational approach based on the Gibbs - Bogoliubov inequality.
   Hinging on the unified and very accurate evaluation of structure factors and thermodynamic quantities provided by the ORPA, we find that the GNMP yields satisfactory results for the alkali metals. Those for the polyvalent metals, however, point to a substantial inadequacy of the GNMP for high valence systems. – Pacs: 61.25.Mv, 61.20.-p, 61.20.Gy

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