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Inelastic Neutron Scattering of Liquid Metal Gallium

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Liquid metals (LMs) – metals that are liquid near room temperature – have fascinated scientists for centuries. In the last few decades, in particular, the extent of their peculiar properties has been highlighted. Properties such as low melting point, high flexibility and stretchability, excellent thermal and electrical conductivities, and biocompatibility have led LMs to a wide variety of applications. While LMs have proven to be an exceptionally useful class of materials, their unique properties also speak to various fundamental physical phenomena. In particular, the (hydro)dynamics of LMs is of interest as they have a uniquely challenging nature: possessing the complex nature of regular fluids as well as a “sea” of electrons – giving rise to unique hydrodynamic effects. Inelastic neutron scattering (INS) is a particularly well-suited technique to investigate such effects as it probes the microscopic hydrodynamic origins in the nanometer-terahertz regime. In this presentation, we shall report our preliminary investigations on Ga across the phase transition from solid to liquid as a function of temperature using inelastic neutron scattering. The analysis of the energy dependence of the phonon density of states at low energy region reveals the transition from E^2 for the solid state to a more or less linear relationship corresponding to the liquid state. The dynamic changes will be further discussed in the content of atomic diffusive properties of the system through analysis of the quasielastic neutron scattering in combination with molecular dynamic simulations.

Level of Expertise

Student

Presenter Gender

Man

Pronouns

Which facility did you use for your research

Australian Centre for Neutron Scattering

Students Only - Are you interested in AINSE student funding

Yes

Do you wish to take part in the Student Poster Slam

Yes

Condition of submission

Yes

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