

Physics of Liquids and Disordered Systems
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Synopsis

This course is intended to illustrate the central ideas and principles of the physics of liquids, amorphous systems, glasses. Connection between the macroscopic and microscopic properties will be examined in details, through the properties of static and dynamic pair correlation functions and nuclear quantum effects in liquids.

Programme

Phase diagrams and the liquid phase. Quantum solids and liquids. Radial distribution functions. Cell model. Macroscopic properties of liquids. Elastic moduli in liquids. Sound propagation in liquids, Viscosity and cell model. Transport properties. Diffusion. Surface energy and vapour pressure. Lindemann's criterion. Van der Waals equation and mean-field approach. Interatomic pair potentials. Correlation functions and thermodynamical averages. Pair correlations for classical and quantum fluids. Pair correlations at the critical point. Molecular dynamics principles. Molecular liquids. Van Hove correlation functions. Static and dynamical structure factor. Glass transition, strong-fragile glass-forming liquids.

Pre-requisites

Thermodynamics; atomic, molecular, and solid state physics.