

日本物理学会九州支部特別講演会

第4回教室談話会

講演題目 : GLASS TRANSITION: FROM TWO TO INFINITE DIMENSIONS

講師 : Prof. Rolf Schilling

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日時 : 10月18日(木) 15:00-16:00

場所 : 第3講義室(理学部2号館2階2249号室)

講演概要 :

An overview of our research on the dependence of the glass transition on spatial dimension d will be given. The introduction (i) recalls a few experimental facts concerning this transition, (ii) sketches crucial steps to derive a microscopic theory - the mode-coupling theory (MCT) - for an ideal dynamical glass transition, and (iii) presents predictions of MCT. Then, MCT-results for monodisperse and binary colloidal liquids in $d=2$ will be compared with those in $d=3$. Comparison with simulational results and the striking similarity of the critical packing fraction ϕ_c with the random close packing result supports validity of MCT in $d=2$. To interpolate between $d=2$ and $d=3$, a colloidal liquid between two parallel plates with distance H is studied, requiring an extension of MCT for bulk liquids. The critical packing fraction $\phi_c(H)$ shows an oscillatory H -dependence implying multi-reentrant glass transitions. It will be shown that these predictions are qualitatively consistent with results from computer simulations. Finally, motivated by Biroli and Bouchaud's conjecture that MCT is a mean field theory, its limit for $d \rightarrow \infty$ is discussed. We find three different length scales on which the physical behavior is different. Taking this into account, we derive the d -dependence, $\phi_c(d) \sim d^{2-d}$, for the critical packing fraction which is in variance with the result from replica theory. Although for $d \rightarrow \infty$ no violation of general properties of correlators is found, I will argue why MCT may not be a mean field theory.

談話会後、食事会を予定しています。出席ご希望の方はご連絡ください。

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