

Seminar

The glass forming ability in binary mixtures

Sarika Maitra Bhattacharyya

National Chemical Laboratory, Pune

When a liquid is cooled very fast, it avoids crystallization due to suppression of nucleation and enters the supercooled liquid regime and on further cooling undergoes glass transition at T_g . The glass forming ability (GFA) is the tendency of the system to avoid crystallization and undergo vitrification. In this talk I will discuss about the properties which contribute to the GFA. I will present a study of different binary mixtures where we have shown that although all of them have a global crystalline minima some undergoes crystallization and some are stable in their supercooled liquid state. Our study suggest that the stability against crystallization comes from the frustration between the locally favoured structure and the global structure. This frustration is manifested best when a global structure is a mixed crystal where a single species contributes to both the crystal form and where the two crystal forms have large difference in some order parameter related to that species. I will then present the study where we have taken one of the glass forming systems and studied it at different compositions. The global minima in all the compositions are a mixed crystal thus in all these systems the frustration between the locally favoured structure and the global structure are similar. However we found that depending on the composition, the barrier to crystallization and thus the glass forming ability varies. We have also shown that the pre crystalline liquid undergoes a demixing process. This variation in the GFA of the different compositions have been connected to the loss of mixing entropy in the process of crystallization. Our study further reveals that the stability of a system against crystallization comes both from kinetics and thermodynamics.

Thursday, Jul 19th 2018

11:30 AM (Tea/Coffee at 11:00 AM)

Seminar Hall, TIFR-H