Discussion of 016405JOR by S. Jatav and Y. M. Joshi

Question: Dimitris Vlassopoulos: In view of your very interesting experimental results, I wonder to what degree some of the interpretations/conclusions are system-specific. This brings the question of detailed characterization of the studied materials and of deciding on what is a model experimental system. The question is motivated in part by the fact that there are far too many data in the literature on Laponites (for example) and some discrepancies among results were attributed to differences in the systems (e.g., release of Mg ions), but also by the potential pi-stacking interactions in the nanodiamonds which may influence their properties (such as temperature and thixotropic effects). Hence, the question relates to whether the behavior of the systems presented can be discussed with the existing physical framework for colloidal gels/glasses and what new (may be system-specific) features are brought. I feel that in view of the far too many experimental systems available, many of which we call "model," when addressing, for example, the physics of metastability transitions here, we all need to clarify the generic features.

Author Response: Yogesh Joshi: The work presented in the paper has two aspects. In the first aspect, 2.8 weight % Laponite XLG suspension having 3 mM NaCl, which is proclaimed to be a repulsive glass in the literature, is observed to demonstrate all the rheological characteristic features of a gelation process that passes through a critical gel state. This aspect is system specific and can be attributed to disk like shape of a Laponite particle with negative faces and positive edge. The second aspect examines rheological behavior of a significantly aged colloidal gel of Laponite particles subsequent to shear melting. In this case, during the shear melting, the gel cannot be broken to an individual particle level. Consequently, the solid pockets containing unbroken network of Laponite particles remain suspended in the shear melted paste of Laponite suspension. Owing to significant volume fraction occupied by these solid pockets, the rheological response of such system is reminiscent of soft glassy materials such as microgel pastes or concentrated emulsions. We believe that this aspect of the paper may not be system specific, and the behavior similar to that reported here could be observed for any other significantly aged colloidal gel upon shear melting.

In Laponite suspension, interparticle interactions can be altered by addition of salt, raising temperature, addition of polymer, which essentially changes the microstructure and the rate of aging. However, if sufficiently aged sample is used subsequent to shear melting, the material shows same qualitative rheological features observed for other soft glassy materials. With respect to release of Mg^{+2} ions in Laponite suspension, such scenario is only observed for low concentrated Laponite suspensions. If concentration of Laponite in suspension is sufficiently high (>2 weight %), leaching of Mg^{+2} ions is not observed for a long period of time [Jatav and Joshi (2014)].

Reference

Jatav, S., and Y. M. Joshi, "Chemical stability of laponite in aqueous media," Appl. Clay Sci. **97–98**, 72–77 (2014).