

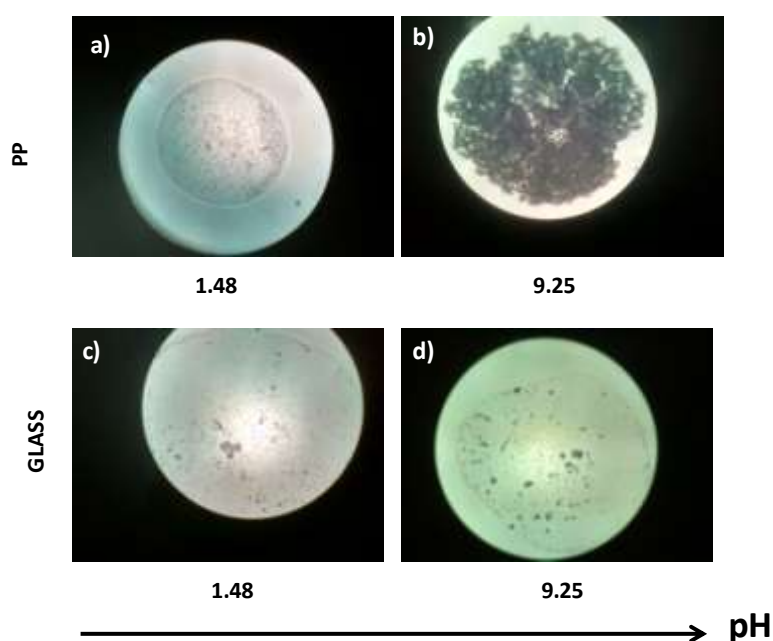
ROLE OF pH AND SUBSTRATE ON DRYING PATTERNS OF LAPONITE DROPLET

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Disc shaped Laponite RD particles in aqueous solution have a net negative charge on the faces and a positive charge along the rim with a pH of 9.7. Changing the pH of the aqueous Laponite solution will determine whether the Laponite particles arrange themselves in a repulsive glass phase or form a cage-like gel structure. When droplets of Laponite solution having different pH are allowed to evaporate, the arrangement of the particles during drying is further perturbed by drift and diffusion currents of mass transfer due to uneven evaporation flux from the droplet surface and Marangoni effects. In this work we report the interesting patterns left by drying droplets of aqueous Laponite with different pH dried on a polypropylene substrate, Figs.(a) and (b). The pH was varied from 1.5 to 13 by adding measured volumes of HCl and NaOH. In highly acidic pH a prominent coffee-ring was observed, while in a strong basic pH, salt crystals on Laponite particles, gathered at the centre of the dried droplet. Similar studies were done on glass substrate with quite different results of dried patterns as shown in Figs.(c) and (d). This proves that substrate effects couple with the role of pH in the determination of the final pattern. We offer an explanation of the different patterns on the basis of intermolecular forces of repulsion between the particles, the attractive van der Waals forces and the resultant Debye length of the electric double layer surrounding each particle.



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