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Dynamics of transparent nanoparticulate liquid marbles KENNETH GAHAN, MAHESH PANCHAGNULA, PRASAD BHOSALE, Tennessee Technological University — Liquid marbles is a term used to describe small quantities of liquids coated with a hydrophobic nanoparticulate substance. This study is motivated by the proposition that liquid marbles can provide for a rapid, contamination-free transport mechanism of bio-fluids. In this context, nanoparticulate liquid marbles are shown to be transparent and mechanically more robust than similar microparticulate marbles. This is shown to be a result of the formation of an elastic nanoparticulate thin film on the liquid free surface. The thin film not only keeps the marble from rupturing but also provides a barrier to diffusion of the material contained in the marble. The current research further seeks to understand the behavior of these liquid marbles under dynamical conditions. The motion of liquid marbles on an inclined plane is studied through high speed imaging. The relationship between nondimensional terminal velocity and the Bond number indicates that the dynamical behavior of these liquid marbles is well-modeled using an angular spring-mass-damper model. Finally, we experimentally validate the prospect of moving the liquid marbles using magnetic actuation.

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