

A viscous granular flow experiment with new refractive index matching material

*Tsai-Jung Lin¹, Chi-Yao Hung¹

1. National Chung Hsing University

Entrainment rate at base controls how far the debris flow can travel and how large the debris flow becomes. Flow rheology of Refractive Index Matching (RIM) material are generally limited by the mono-particle properties (such as polymethyl methacrylate/liquid para-cymene etc.). In this study, a new RIM material (polyacrylamide polymer/18% Methanol solution) having a wide range of particle size distribution and viscosity (Fig. 1L) are purposed to visualize and measure the erosion process of mobile bed dam break experiments. Various rheology models may be formed by the different ratio of particle size. To improve the contrast between the particle phase and the liquid phase, a dye is used to make the particles bright under laser illumination. By varying the dye concentration, the entraining/detraining processes are easily distinguished (Fig. 1R). Granular motion is captured through a high-speed camera and Particle Tracking Velocimetry (PTV) method. Finally, an empirical relationship between the rheology and the entraining/ detraining process is developed.

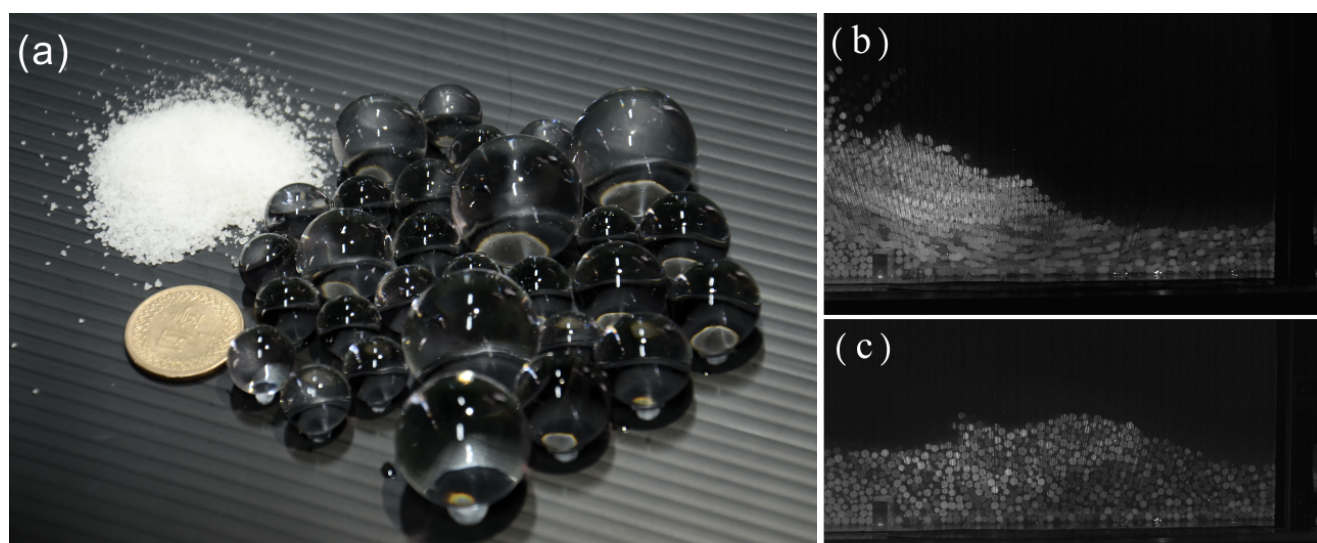


Fig.1 Experimental image (a)wide range of particle size; (b)longexposure image of dam break occurrence; (c)particles with different concentration of dye.