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Transition in the glassy dynamics of melts of acid hydrolyzed phytoglycogen nanoparticles

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Phytoglycogen (PG) is a natural polysaccharide produced in the form of compact, 44 nm diameter nanoparticles in the kernels of sweet corn. Its highly branched, dendritic structure and soft, compressible nature leads to interesting and useful properties that make the particles ideal as unique additives in personal care, nutrition, and biomedical formulations. These applications are particularly dependent on the softness of PG, which can be controlled through chemical modifications. We consider the effect of acid hydrolysis on the softness of PG by characterizing the fragility of acid hydrolyzed PG glasses: as acid hydrolyzed PG particles are dispersed in water at packing densities approaching their soft colloidal glass transition, the dependence of the zero-shear viscosity on effective volume fraction abruptly changes from behaviour well-described by the Vogel-Fulcher-Tammann equation to more Arrhenius-like behaviour. This result is consistent with stronger glass behaviour for acid hydrolyzed PG relative to that for native PG, suggesting that acid hydrolysis of PG makes the particles softer.

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