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Shear-thickening of a non-colloidal suspension with a viscoelastic matrix MARCO ELLERO, Basque Center for Applied Mathematics, ADOLFO VAZQUEZ-QUESADA, Universidad Autonoma de Madrid, PEP ESPAOL, Universidad Nacional de Educacion a Distancia (UNED) Madrid, ROGER TANNER, University of Sydney — In this work we study the rheology of a non-colloidal suspension of rigid spherical particles interacting with a viscoelastic matrix. Three-dimensional numerical simulations under shear flow are performed using the smoothed particle hydrodynamics method and compared with experimental data using different elastic Boger fluids. The rheological properties of the Boger matrices are matched in simulation under viscometric flow conditions. Suspension rheology under dilute to semi-concentrated conditions is explored. It is found that at small Deborah numbers De, relative suspension viscosities η_{r}exhibit a plateau at every concentration. By increasing De shear-thickening is observed. Under dilute conditions (φ =0.05) numerical results for η_{r}agree quantitatively with experimental data. By increasing the solid volume fraction towards φ =0.3, despite the fact that the trend is well captured, the agreement remains qualitative. With regard to the specific mechanism of elastic thickening, the microstructural analysis shows that it correlates well with the averaged viscoelastic dissipation function, requiring a scaling as $\mathrm{De}^{\alpha}$with an exponent α greater than 2 to take place. Locally, flow regions responsible of the elastic thickening are well correlated to areas with significant extensional component.

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