

Electronic Supplementary Information

Surfactant Effect on the Electrorheological Performance and Colloidal Stability

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Particle size distribution of BTRU particles

The BTRU particle size distribution was measured by a particle size analyzer with the average diameter of 534.6 nm and the dispersity of 0.497.

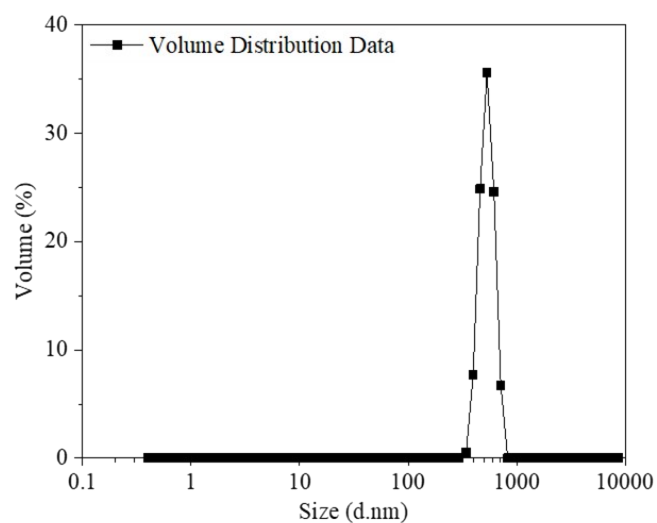


Figure S1. Size distribution of urea-coated barium titanyl oxalate (BTRU) particles measured by a particle size analyzer (Mastersizer 2000, Malvern Instruments Ltd.) and recorded by particle sizing software (Malvern Instruments Ltd.).

Yield stress variation of the ER suspension with surfactant concentration

The yield stress value, as shown in Figures S2a and S2b, is demonstrated by using step-function voltage pulses resulting in the applied electric field changing from 1 to 5 kV/mm. We find that the Span surfactant addition enhances the electrorheological (ER) properties of the suspension by presenting higher yield stress value. With different surfactant concentration, the ER responses of the suspension are varied. The ER fluid with the addition of 0.4 wt.% Span 20 has the highest yield stress values, as depicted in Figure S2a.

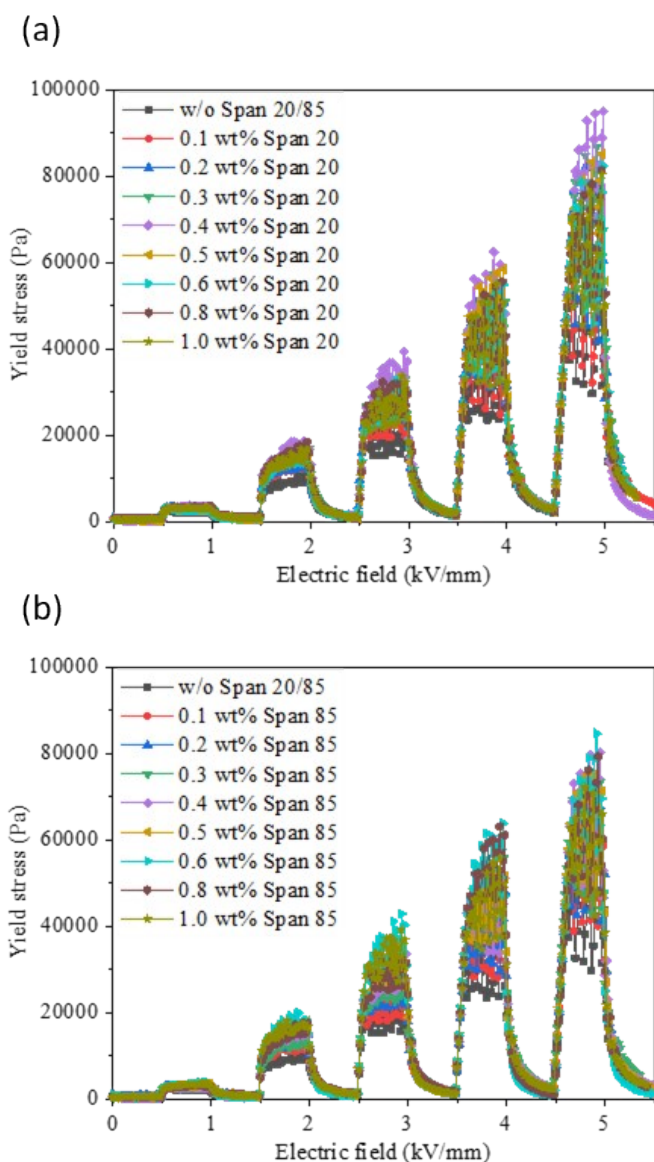


Figure S2. Yield stress demonstrated as 5 peaks of the incremental electric voltages of the ER suspensions doped with (a) Span 20 and (b) Span 85 in different weight fractions.

Particle size of the BTRU particles and the agglomerated particles in the ER suspension

The particle size of a single BTRU particle was measured by a particle size analyzer with the average diameter of 534.6 nm and the dispersity of 0.497. The average diameter of particles in ER suspensions doped with different Span surfactants were measured and calculated by the Turbiscan dispersion stability analyzer (Turbiscan Tower, Formulation SAS).

Table S1. Average diameter of the BTRU particles and the agglomerated particles with different concentrations of Span surfactants

Particles in ER suspension	Particle size (μm)
BTRU particles	0.535 $\pm$ 0.001
w/o Span 20	3.869 $\pm$ 0.028
0.4 wt.% Span 20	3.790 $\pm$ 0.031
0.8 wt.% Span 20	3.507 $\pm$ 0.027
1.2 wt.% Span 20	3.450 $\pm$ 0.016
0.4 wt.% Span 85	3.813 $\pm$ 0.026
0.8 wt.% Span 85	3.648 $\pm$ 0.019
1.2 wt.% Span 85	3.488 $\pm$ 0.019