

Electronic Supplementary Information (ESI)

**Preparation of uniform titania microspheres with good
electrorheological performance and their size effect**

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1. Preparation of T27Cl

4 mL of TBT was chelated by mixing with EG (90 mL) under vigorously stirring for 8 h at room temperature. Then, the above solution was poured into 400 mL of acetone containing 5 mL of DI water and 1.5 mL of HCl with stirring for 2 h. After aging for 3 h, the white precipitate was harvested by centrifugation, followed by washing with ethanol several times to remove residual EG from the surface of the titanium glycolate particles. Then the titanium glycolate precursor was added to 50 mL of DI water, and was magnetically stirred at 70 °C. After stirring for 8 h, the white precipitate was obtained by centrifugation, followed by washing with water several times and keeping under vacuum at 60 °C.

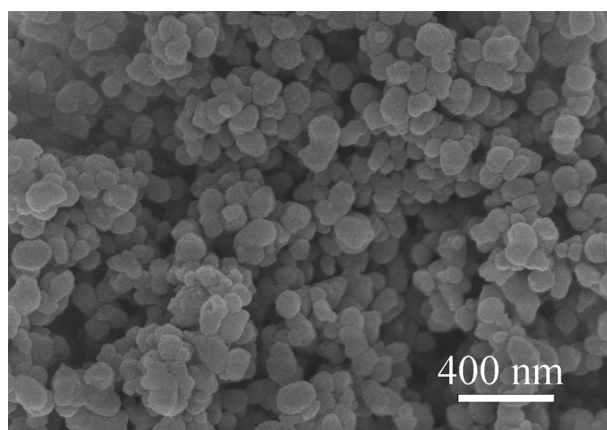


Fig. S1 SEM image of the T27Cl titania particles

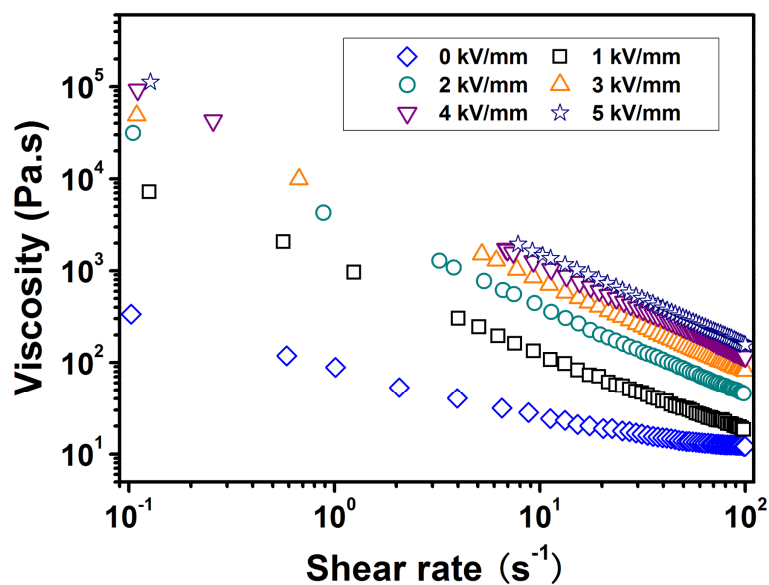


Fig. S2 Flow curves of shear viscosity as a function of shear rate for the T27 based ER fluid.

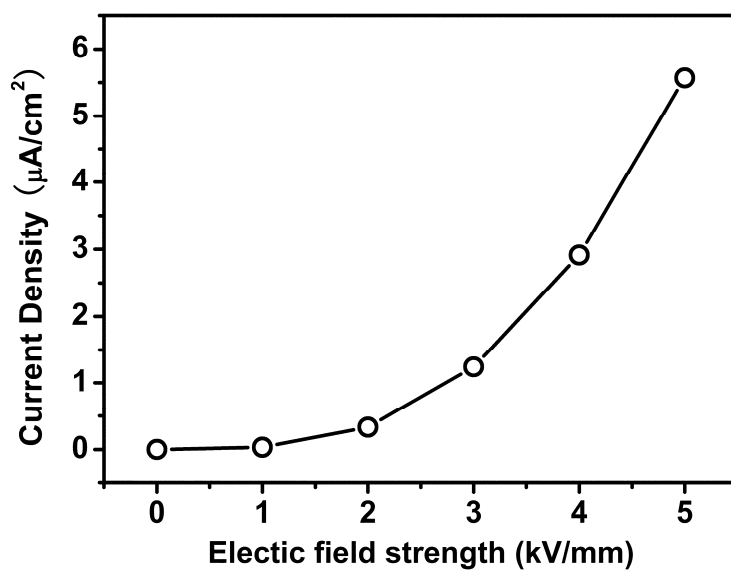


Fig. S3 Current density of T27 based ER fluid under various electric field strengths.

2. Preparation of T42/AA

The titanium glycolate precursor of T42 was added into 400 mL of acetone containing 5 mL of DI water and 2.0 mL of AA. After stirring for 2 h, the particles were harvested by centrifugation, followed by washing with ethanol several times to remove residual EG from the surface of the titanium glycolate particles. Then the titanium glycolate precursor was added to 50 mL of DI water, and was magnetically stirred at 70 °C. After stirring for 8 h, the white precipitate was obtained by centrifugation, followed by washing with water several times and keeping under vacuum at 60 °C.

3. Characterization

The thermal properties of T42, T24, and T42/AA titania particles were determined by the Perkin-Elmer Pyris Diamond thermogravimetric/differential thermal analyzer, with a heating rate of 10 °C/min (between 20 and 400 °C) in N₂ environment.

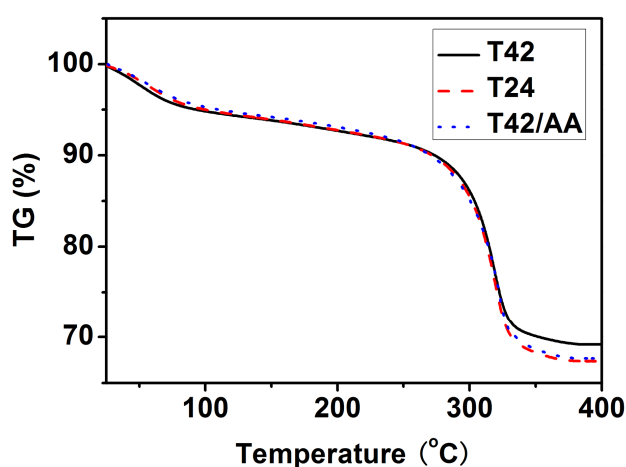


Fig. S4 TG curves of T42, T24 and T42/AA titania particles

Fig. S4 shows the TG curves of T42, T24, and T42/AA titania particles recorded under a flow of N₂ gas. It is observed that a two-step pattern for weight loss in the temperature ranges of 20-400 °C. The first weight loss between 25-105 °C is assigned to desorption of physically adsorbed water, and the second weight loss between 150-350 °C corresponds to the removal and degradation of ethylene glycol units and AA. Therefore, we can calculate the content of physically adsorbed water and organic

groups in these microspheres. As the result, there is approximately 6% of water in three kinds of particles, 24% of organic groups in T42 particles, and 26% of organic groups in T24 and T42/AA particles.