

ELECTRORHEOLOGICAL (ER) FLUIDS

Sponsor: USDOT/FHWA Grant No. DT-FH 61-01C00002

An ER fluid is typically a suspension consisting polarizable nano/micro-meter particles well dispersed in a non-conducting, low-viscosity medium.

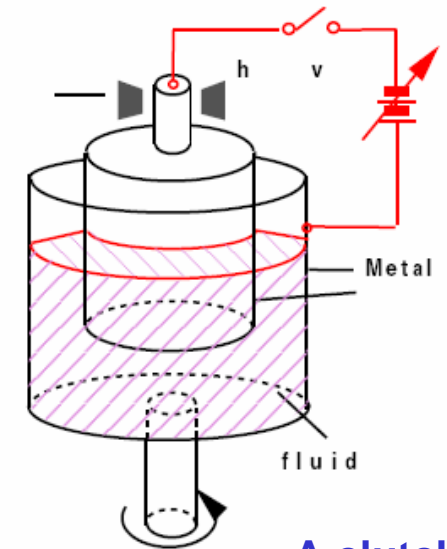
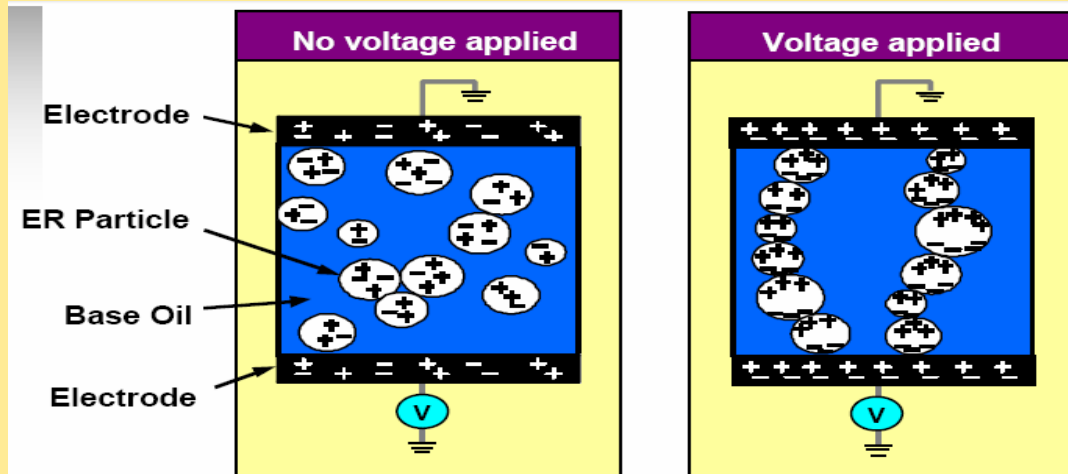


ER fluid transformed into a SOLID upon the application of electric field $\sim 1\text{kV/mm}$



Upon the removal of E-field the ER fluid is instantaneously transformed back into a LIQUID

Mechanism and Applications of ER Fluids



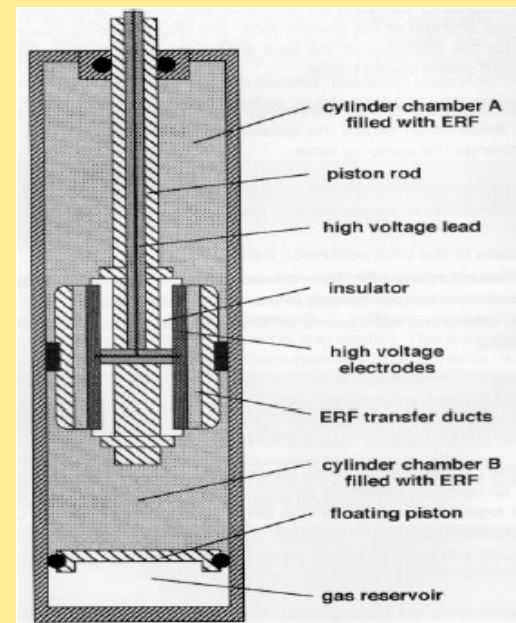
ER EFFECT

- Viscosity increase $\sim 10,000$ times
- Instantaneous response $\sim 1\text{ms}$
- Reversible liquid \Leftrightarrow solid change

ER APPLICATIONS

- Vibration control of structures
- Shock absorbers and dampers
- Torque transfer devices

Magnetorheological (MR) fluids



Controllable Fluid Devices with ER or MR Fluids

Objectives

- Development and characterization of high performance ER and MR fluids
- Evaluation of ER fluids as damage sensors for FRP module joint response detection
- Exploration of ER or MR fluids for vibration control of smart structures
- Development of controllable-fluid devices for structural health monitoring of civil structures