Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Physics of Nontraditional Electrorheological and Magnetorheological Fluids G.Q. GU, R TAO, Dept of Physics, Temple University, Philadelphia, PA — Nontraditional electrorheology (ER) and magnetorheology (MR) are new areas. It started with high demands, such as reducing the viscosity of crude oil and suppressing turbulence to improve crude oil flow in pipelines. Normally, these two goals conflict each other. When the viscosity is reduced, Reynolds number goes up, and the turbulence would get worse. The non-traditional ER and MR have provided unconventional technologies to solve such issues. Different from traditional ER and MR, where the strong electric field or magnetic field is applied in the direction perpendicular to the flow or shearing, the fluid can even be solidified as the viscosity increases dramatically. In nontraditional ER and MR, the electric field or magnetic field is applied in the direction parallel to the flow, the particles are aggregated into short chains along the flow direction by the field, and the fluid viscosity becomes anisotropic. Along the flow direction, the viscosity is reduced, while in the directions perpendicular to the flow, the viscosity is dramatically increased. Thus the turbulence is suppressed; the flow becomes laminar and is further improved by the reduced viscosity along the flow direction. The original conflicted two goals can now be accomplished simultaneously. The new physics began to produce big impacts on energy, food industry, and medical science.

Rongjia Tao
Dept of Physics, Temple University, Philadelphia, PA

Date submitted: 13 Nov 2016 Electronic form version 1.4