
GENERAL INFORMATION

1. Title of dataset

Active control of friction in electrified ball bearing prototypes using electro-sensitive clay mineral-based lubricating fluids

2. Contact

Principal Investigator Contact Information

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3. Description of the project

Project "Advancing Toward Smart Lubrication Control Through Sustainable Electrorheological Fluids": SMART-FRICTION, (PID2023-151761NB-I00), funded by MICIU/AEI/10.13039/501100011033 and by FEDER, EU under the 2023 Knowledge Generation projects call. It is led from the University of Huelva, and mainly developed at Center for Research in Chemical Products and Process Technology (Pro2TecS). Main objectives: generating scientific and technical knowledge that will advance the innovative concept of intelligent lubrication control using sustainable electrorheological fluids; developing a new generation of electroactive biolubricants that allow instant, on-demand control of their rheological and tribological properties through the action of an external electric field.

4. Description of the dataset

This research highlights the development of electro-active eco-friendly lubricants by dispersing polarizable clay nanoparticles in castor oil. These smart fluids exhibit controllable viscosity and friction properties under applied electric fields, enabling reversible tuning of lubrication performance. Experiments showed enhanced friction control, improved lubricant retention, and promising dielectric strength, pointing to a sustainable approach for actively managing friction and load-bearing in mechanical systems through electric field modulation.

5. Notes

6. Deposit date

3/10/2025

7. Date

3/10/2025

8. Language

English

AUTHORS INFORMATION

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METHODOLOGY

1. Methodology

Electro-rheological measurements carried out in an ARES G2 controlled rate rheometer (TA Instruments, USA), equipped with a special electrorheocell, a Keysight 33210A electric field generator (Agilent, USA) and a Trek 609E-6 high-voltage power amplifier (Trek Inc., USA)

Electro-tribological analysis carried out in a Physica MCR-501 controlled stress rheometer (Anton Paar, Austria) equipped with a customized ball bearing arrangement, a 9183B voltage generator (BK Precision Corp, USA), and a Parstat 4000A potentiostat-galvanostat (Ametek, USA) [voltages up to 20 V] or a FUG 12500 generator (FUG, Germany) [voltages up to 1,000 V].

More info: <https://doi.org/10.26599/FRICT.2025.9441023>

2. Software

Ms Excel

KEYWORDS

1. Keywords

smart lubricant; sustainability; ball bearing; active control of friction; nanoclay mineral

SPONSORSHIP INFORMATION AND GRANT IDs

1. Grant Information

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RELATED PUBLICATIONS

1. Related publication

Fernandez-Silva SD, Delgado MA, Roman C, et al. Friction 2025, 13(5): 9441023.

<https://doi.org/10.26599/FRICT.2025.9441023>

2. Related dataset

GEOGRAPHIC INFORMATION

1. Spatial coverage

Universidad de Huelva, Pro2TecS Research Center, Huelva (Spain)

Fraunhofer Institute for Mechanics of Materials IWM, MicroTribology Center $\frac{1}{4}$ TC, Freiburg (Germany)

TEMPORAL INFORMATION

1. Time period coverage

FILES

1. Files

LICENSES AND PRIVACY

1. Licenses

2. Privacy

OTHERS

1. Data dictionary

