
GENERAL INFORMATION

1. Title of dataset

Tunable structuring of nanocellulose-based sustainable lubricants by an external electric field

2. Contact

Principal Investigator Contact Information

Name: Moises Garcia Morales

Institution: Universidad de Huelva (Spain)

Email: moises.garcia@diq.uhu.es

ORCID: 0000-0003-4153-487X

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 examines sustainable nanocellulose-based lubricants made by dispersing fibrillated and crystalline nanocelluloses in castor oil. The study explores how electric fields and shear forces affect their rheological behavior and microstructure, using advanced microscopy and rheometry techniques. Findings show that lower nanocellulose concentrations form flexible string-like structures responsive to electric fields, while higher concentrations create rigid, entangled networks. Pre-shear intensity influences structural changes, altering the lubricants' mechanical properties under different electric fields.

5. Notes

6. Deposit date

3/10/2025

7. Date

3/10/2025

8. Language

English

AUTHORS INFORMATION

1. Authors

Name: Samuel D.

Last name: Fernandez-Silva

Institution: Universidad de Huelva (Spain)

Email: samuel.fernandez@diq.uhu.es

ORCID: 0000-0001-6253-1497

Name: Miguel A.

Last name: Delgado

Institution: Universidad de Huelva (Spain)

Email: miguel.delgado@diq.uhu.es
ORCID: 0000-0003-0573-7987

Name: Maria
Last name: Garcia-Perez
Institution: Universidad de Huelva (Spain)
Email: maria.gperez@diq.uhu.es
ORCID: 0000-0001-5957-3952

Name: Claudia
Last name: Roman
Institution: Universidad de Huelva (Spain)
Email: claudia.roman@diq.uhu.es
ORCID: 0000-0002-7960-5832

Name: Moises
Last name: Garcia-Morales
Institution: Universidad de Huelva (Spain)
Email: moises.garcia@diq.uhu.es
ORCID: 0000-0003-4153-487X

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).

Optical analysis carried out using a portable optical microscope.

More info: <https://doi.org/10.1016/j.jmrt.2024.12.183>

2. Software

Ms Excel

KEYWORDS

1. Keywords

Nanocellulose; Lubricant; Electrorheology; Oscillatory shear; Optical microscopy analysis

SPONSORSHIP INFORMATION AND GRANT IDs

1. Grant Information

"Generacion de Conocimiento 2023" project (PID2023-151761NB-100) funded by MICIU/AEI/10.13039/501100011033 and by FEDER, UE.

Samuel David Fernandez-Silva acknowledges "Ayudas para la Contratacion Predoctoral de Personal Investigador en Formacion 2021, Junta de Andalucia" (PREDOC_01696).

RELATED PUBLICATIONS

1. Related publication

Fernandez-Silva SD, et al. Journal of Materials Research and Technology 34 (2025) 2828–2835.

<https://doi.org/10.1016/j.jmrt.2024.12.183>

2. Related dataset

GEOGRAPHIC INFORMATION

1. Spatial coverage

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

TEMPORAL INFORMATION

1. Time period coverage

FILES

1. Files

JMRT 2025 34 2828-2835.xlsx

LICENSES AND PRIVACY

1. Licenses

This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/bync/4.0/>).

2. Privacy

OTHERS

1. Data dictionary