



XXI CONGRESSO NAZIONALE DELLA DIVISIONE DI
CHIMICA DELL' AMBIENTE E DEI BENI CULTURALI
CREMONA, 10-13 SETTEMBRE 2025

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BOOK OF ABSTRACT

POSTER 25093

Characterization of lubricant waste from steel wiring industry and its potential inclusion in a polymeric matrix, within a circular economy approach

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The steel wire drawing industry generates large amounts of solid lubricant waste, primarily composed of sodium and calcium stearates. Managing this waste is becoming increasingly challenging due to stricter regulations and rising costs, urging for sustainable strategies. This study investigates the composition, variability, and potential reuse of lubricant waste from two industrial sites in Northern Italy (Lecco), aiming to reintroduce the material into polymeric matrices in line with circular economy principles.

Waste samples were characterized by proximate analysis, FTIR, XRD, XRF, DSC, and SEM-EDS techniques. Results revealed that the waste exhibits high ash (>50%) and low volatile solids content. FTIR and DSC confirmed the persistence of stearate components in the spent lubricants. Magnetic separation proved effective in removing iron, with SEM-EDS confirming final Fe content <1%. A selected waste sample, after pre-treatment, was used to produce LDPE-based masterbatches and composites containing 2000 and 5000 ppm of waste. Mechanical tests on the resulting materials showed promising processability, opening the path for potential industrial applications of these composites. This work demonstrates the feasibility of incorporating stearate-based lubricant waste into polymeric matrices after minimal treatment. Such a valorization route not only reduces the environmental pressure of disposal but also contributes to resource efficiency in material production.

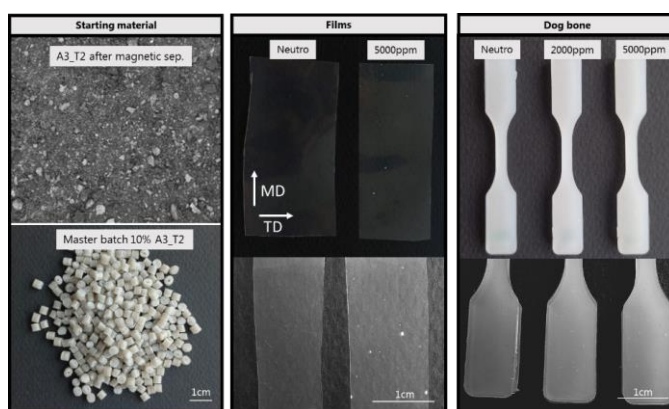


Figure 1. Preparation of composites with lubricant waste: raw material, masterbatch, films, and dog bones.