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EFFECT OF MECHANICAL RECYCLING OF PLA AND ASSESSMENT OF THE ENVIRONMENTAL PROFILE OF PLA AND PET FILMS BY LCA METHODOLOGY.

F. Mansi, M. R. Galdi , L. Incarnato

University of Salerno, Chemical and Food Engineering Department via Ponte Don Melillo, 84084 Fisciano, Salerno - Italy.

E-mail: mrgaldi@unisa.it, lincarnato@unisa.it .

In recent years, research in biodegradable polymers has received increasing attention because of their wide range of applications in packaging, biomedical, and agriculture fields. Among the biopolymers considered for food packaging applications (Mater Bi, PHA (poly hydroxy acid alcanoate), PHB (poly hydroxy butyrrate), PLA (polylactic acid), cellulose, etc. ..), the PLA seems to be the most promising one, thanks to its good optical, mechanical and rheological properties that make it versatile and easy to process.
Plastics packaging produced in industrial processes usually contain a part of recycled polymer arising by internal-production rejects. Moreover, since the PLA could become an economically viable commodity plastic in many industries, the question of recyclability of industrial production and packaging wastes is rising.
The aim of the present work is to evaluate the effects induced by mechanical recycling on functional properties of PLA films for food packaging. In particular, the recycling has consisted in multiple extrusion processes of PLA pellets followed by film production cycles.
Mechanical, gas permeability and optical analyses and overall migration tests have been carried out on films to investigate the effect of multiple recycling on their final properties.
Moreover, further objective of the work is to assess the environmental impact of biaxial oriented PLA films in comparison with PET films, in order to establish the sustainability of bio-polymeric articles compared to petroleum-based products.
At this regard, SimaPro 7.2 software was applied to perform a Life Cycle Assessment (LCA) of the films, by considering the environmental impact of the raw materials, by analyzing and comparing the energy consumption of each stage of the film process and by assuming plausible scenarios for the end-life of the films.