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Área: MAT

Polyethylene and Cellulose-Based Composites from Cellulose Solutions

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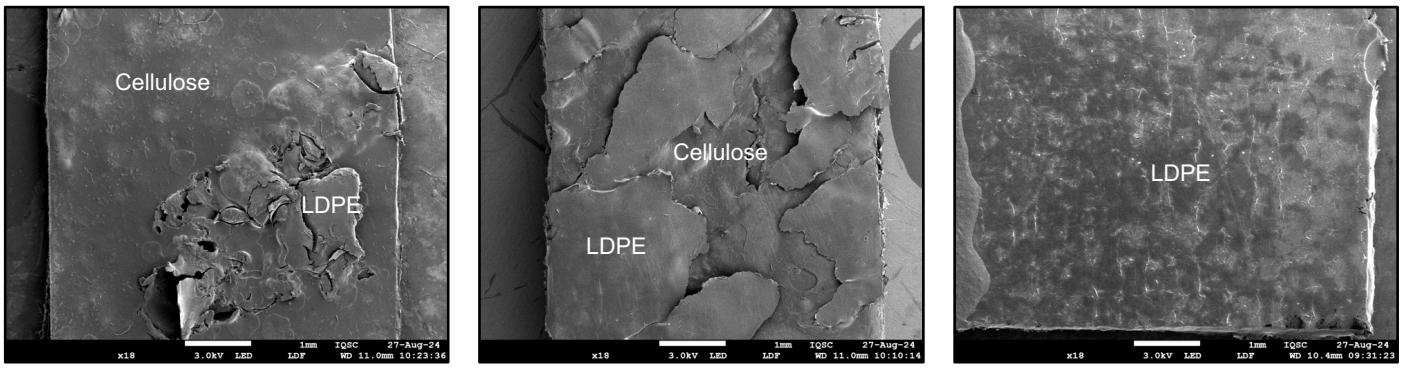
Keywords: *carbon disulfide, continuous structure, film casting, renewable polymer, viscose.*

Highlights

The work aimed to exploit the potential of the cellulose dissolution and regeneration to obtain a material in which polyethylene were dispersed throughout the structure.

Abstract

Cellulose is an abundant, biodegradable, stable and difficult to process natural resource. When this limitation is overcome, cellulose becomes a valuable and versatile resource in the development of new products. Polyethylene, on the other hand, is a synthetic polymer that presents high chemical resistance, good processability, tenacity, flexibility and transparency, in addition to its low cost. There are several studies that address the use of these two polymers to obtain new materials, however, in most of these studies, cellulose is used in its native form to act only as reinforcement in composites. Even when regenerated cellulose is utilized, it is often applied in the form of threads to reinforce thermoplastic films. In this context, the present work aimed to create a material in which polyethylene grains were dispersed throughout a continuous cellulose structure. To achieve this, cellulose was dissolved using the viscose method, and films were prepared on a Teflon plate by incorporating low-density polyethylene (LDPE) grains into the cellulose xanthate solution. After the films dried and detached from the plate, they were regenerated using a 20% aqueous glycerol solution. The resulting film underwent heat pressing, which caused the polyethylene grains to soften and bond, forming larger structures that fit into the cavities of the regenerated cellulose network. SEM images of the surface of the materials after heat pressing highlight structural variations based on the polyethylene content (Figure 1). Mechanical testing revealed that the material becomes more fragile and stiff when the two components are present in similar proportions.



10% LDPE 50% LDPE 90% LDPE

Figure 1. SEM images of the surface of the materials obtained after heat pressing.

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