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Thermoplastic Blends of Corn Gluten Meal/Poly(Hydroxybutyrate-Co-Hydroxyvalerate) (CGM/PHB-V)

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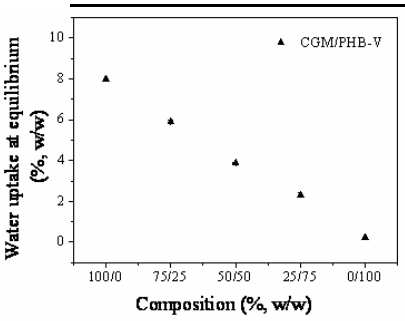
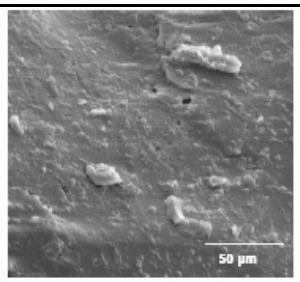
Corn gluten meal/poly(hydroxybutyrate-co-hydroxyvalerate) (CGM/PHB-V) blends were prepared in different proportions. The glycerol content was 20% in weight of the total mass of polymers (dry basis). The compositions consisted of 100/0, 75/25, 50/50 25/75 and 0/100 of CGM/PHB-V. The blends were prepared by melting in a Haake torque rheometer, followed by hot compression molding. The water absorption at equilibrium decreased with increasing PHB-V content. Tensile tests showed that the presence of PHB-V enhanced their rigidity.

The combination of CGM with other biodegradable polymers such as poly(hydroxybutyrate-co-hydroxyvalerate (PHB-V) may show a promising potential in the field of biodegradable plastics [1]. The existence of nonpolar groups in CGM could lead to interactions between the nonpolar groups in PHB-V, rendering the blend mechanically viable. Additionally, blending CGM with these polymers may not only modify its mechanical properties but also improve its processability. In this study, CGM/PHB-V blends were prepared with CGM to PHB-V ratios of: 100/0, 75/25, 50/50 25/75 and 0/100 in weight. The glycerol content was 20 wt% by weight (dry base) of the total mass of polymers. The mixtures were prepared by melting in a Haake torque rheometer at 160ºC, 50 rpm for 6 min. The mixtures obtained were molded by heat compression and than characterized by tensile test and water absorption experiments. Figure 1 shows absorption curves of equilibrium water as a function of composition for the CGM/PHB-V blends plasticized with 20% glycerol. The addition of PHB-V triggered the reduction of water absorption in blends containing CGM. The table 1 shows the mechanical properties: Young's Modulus (E), elongation at break (ε), ultimate tensile strength (σ_r) for CGM/PHB-V blends with 20% glycerol. Note that the addition of PHB-V caused a significant increase in the values of ultimate tensile strength (σ_r) of the blends containing CGM. The deformation at break (ε_r) of plasticized CGM (CGM) did not lead to a significant variation in the values of ε_r with the addition of PHB-V. The increase of PHB-V content in the blends with gluten caused the modulus of elasticity (E) to increase. These results indicate that the addition of PHB-V to the blends with CGM increased their water absorption and rigidity.

Table 1: mechanical properties for CGM/PHB-V blends.

CGM/PHB-V	E(MPa)	σ_r (MPa	ε(%)
100/0	256.5 ± 14.0	1.1 ± 0.1	3.7± 0.3
75/25	275.0 ± 22.0	1.3± 0.1	3.3 ± 0.5
50/50	431.0 ± 60.0	1.6 ± 0.2	5.4 ± 0.9
25/75	834.0 ± 80.0	1.7 ± 0.2	8.7 ± 2.0
0/100	1762.0± 50.0	3.8 ± 0.3	28.2 ± 2.4





CGM/PHB-V 50/50