Additive influence on properties of cassava starch foams.

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The use of agricultural resources as a biodegradable and renewable raw material for products such as packaging is desirable and environmentally friendly alternative to nondegradable petroleum based plastics. Starch foam can be used as biodegradable packaging and normally is used PVA as additive to improve their mechanical properties. In this study were used another additive (PEG 300, 1500, 6000) and compare with PVA. PEG is generally used in biodegradable films as plasticizer and show satistactory results in mechanical properties. In this study, foams with PEG 300 presented no significance difference in mechanical characteristics compared with PVA foams.

Introduction The use of agricultural resources as a biodegradable and renewable raw material for products such as packaging is desirable and environmentally friendly alternative to nondegradable petroleum based plastics. Starch is an interesting alternative due to form resistant foam under controlled wet and warm conditions. The starch foam is obtained by thermopressing process, where starch dough (cassava starch, water and additive) is processed to form a rigid structure by swelling, gelatinization and network formation. Additive is used to improve the mechanical properties of starch foams. Shogren et al (1998) investigated the foams with and without PVA additive and concluded that the additive improved the strength and flexibility of the foams. In all studies about starch foams, only PVA is used as additive (Glenn, Orts, Nobes, 2001; Shogren, Lawton and Tiefenbacher, 2000 and 2002). In this work was used other plasticizer type, the polyethyleneglycol (PEG) with different molecular weighs (300, 1500 and 6000) and compared with PVA. PEG was chosen because was used as an plasticizer in edible films with good performance compared with other plasticizer (Parra et al, 2004). The foams obtained were characterized by physical methods (compression resistance and flexibility) and by Scanning Electronic Microscopy (SEM).

Results and Discussion In physical results, foams with PEG 300 and PVA presented more compression resistance, but foam with PEG 1500 presented more flexibility, as shown in Figures 1 and 2, respectively. Statistics analysis (ANOVA) shown that foams with PVA and PEG 300 presented no significance difference in resistance compression and flexibility results.

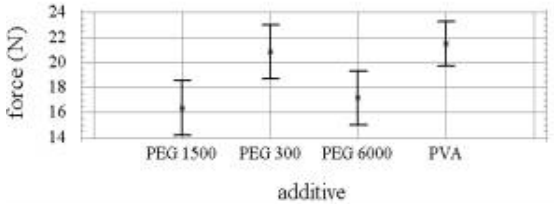

Figure 1 – Compression resistance foam with different additives .

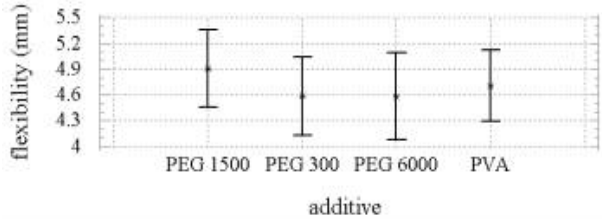

Figure 2 – Flexibility foam with different additives

Observing SEM analysis, foam with PVA and PEG (Figures 3 and 4 presented the internal structure homogenous, but in PVA foam the alveolus are lower. In PEG 1500 foam (Figure 5), the internal structure is heterogeneous, with a big opened cell, for this reason, the foam presented more flexibility.

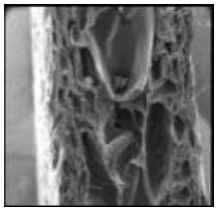

Figure 3. SEM of foam with PEG 300

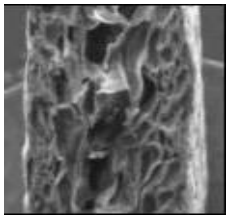

Figure 4 SEM of foam with PVA

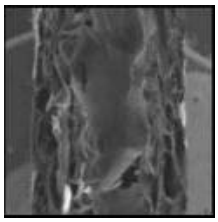

Figure 5. SEM of foam with PEG 1500

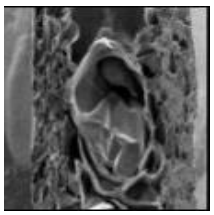

Figure 6 SEM of foam with PEG 6000

Conclusion In conclusion, the plasticizer PEG in all molecular weigh studied is compatible with starch foam and could be chosen for the production of foam in place of PVA, depending on the desired properties.

References

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