

**Thermoplastic Starch modified by reactive extrusion in one and two-steps with citric acid and 4,4- methylene diphenyldiisocyanate**Tamires de Souza Nossa <sup>(1)\*</sup>, Antonio José Felix Carvalho <sup>(1)</sup>

(1) Departamento de Engenharia de Materiais, Escola de Engenharia de São Carlos, Universidade de São Paulo, São Carlos, SP, Brazil

\* tamires@usp.br

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**Abstract:**

The chemical modification of thermoplastic starch (TPS) by reactive extrusion (REX) is a very effective way to create new materials from starch at low cost and versatile processing conditions [1] [2]. Here we describe the modification of starch by REX using citric acid (CA) and 4,4-methylene diphenyldiisocyanate (MDI). CA was used as depolymerisation agent and MDI for starch polymerization. The samples were made by two methods: (i) all reactants and the raw materials were processed in a only step where depolymerisation-polymerization happen at the same time and (ii) the processing was conducted in two steps: firstly the starch was depolymerised by CA and this sample was repolymerized with MDI in another reactive extrusion. The purpose of this experimental strategy was to understanding on the process of depolymerisation and polymerization previously described [3]. The samples were characterized by Fourier transform infrared spectroscopy (FTIR) and contact angle (CAM). FTIR showed the formation of urethane peaks in high proportion in the two step procedure. From CAM analyses it was estimated the surface energy of materials. The surface energy from materials produced by only step is higher than energy surface values of materials produced by two steps, therefore the processing influences in the hydrophobicity of samples.