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COMPARATIVE STUDY BETWEEN VEGETAL AND PETROCHEMICAL BASED POLYOLS IN THE RECYCLED POLYURETHANE RIGID FOAMS PROPERTIES

M. R. Mezzomo^c, G.P. Bernardes^b, R. M. C. Santana^{a,*},

^{a,b,c}*Department of Materials - Federal University of Rio Grande do Sul - UFRGS, Porto Alegre-RS/Brazil,*

**Corresponding author: ruth.santana@ufrgs.br*

Polyurethane (PU) is a polymeric material produced by the reaction of two main components: a polyol and an isocyanate (some additives are also used). While the isocyanate is typically derived from oil, the polyol can be also produced from a vegetal source. In this study both types (one vegetal and one petrochemical) of polyol were used. They were reacted with their correspondent isocyanates.

The aim of this work is to study the influence of both the presence of filler and its particle size in mechanical and physical properties of the PU rigid foam. This filler consisted of discarded PU rigid foam that was grinded to two different ranges of sizes: 90-250 μ m and 250-500 μ m. It was mixed with the polyol before the reaction with the isocyanate and represented a portion of 5% in weight of the foam produced. Blocks of rigid PU foam without filler were also produced to compare them with the ones that contained the coarser and the finer filler. Thus there were six different formulations, i.e. two different groups of raw materials (vegetal and petrochemical polyols) and three different filler situations (without any amount, with the 90-250 μ m filler and with the 250-500 μ m).

Mechanical and physical properties of the rigid polyurethane foams were analyzed. It is possible to observe a difference in the cell structure comparing the foams loaded and those unloaded. The density did not vary significantly when the load presence or size was taken in consideration, but the petrochemical based polyol produced foams with lower densities. Compression tests were performed with a deformation limit of 10% since the samples would not fracture. The tension value at the deformation of 10% tended to decrease for the loaded foams. The rigid foams with filler of bigger particle size showed lower tensile values at a 10% relative deformation when compared to the blanks that contained the finer filler.