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# Analysis of the recyclability of polypropylene (PP) and polyethylene (PE) waste disposed at coastal ecosystems

**Diego Piazza, Kaue Pelegrini** and **Rosrmay N Brandalise Dra**
University of Caxias do Sul, Brazil

**Introduction:** One of the major environmental problems is the issue of the contamination of marine fauna and flora. Animals are prone to death by strangulation when trying to feed, involuntarily, on polymer waste present in this environment. Most of the plastic debris present on the coast has its origin of inappropriate disposal. This work aims at studying and developing a methodology for the recycling of polymers present in coastal ecosystems, comparing their properties with commercial polymers.

**Experimental:** The polymers used in the development of this work were collected at the beach of Torres/Brazil with the help of the Praia Limpa Torres team, in September, 2015. 169.0 kg of waste was collected, from which 20.8 were polymers. The presence of higher amounts of PE and PP is highlighted. After cleaned and dried, they were ground in a knife mill. The resulting product had an average particle size distribution of 20 mm and was separated according to different densities. Afterwards the polymers were extruded in a single-screw extruder at the temperature profile of 170/185/200°C for PE and 180/195/210°C for PP. Afterwards, test specimens were obtained by injection, and then submitted to the flexural strength (ASTM D790), and melt flow index (performed under 190°C, 5 kg and 20 s for PE; 230°C, 2.16 kg and 10 s for PP) tests.

**Results:** The modulus of elasticity and melt flow index results for the PE and PP waste were similar to virgin polymers produced by Braskem®. The fall in flexural modulus of elasticity was not attributed to polymer degradation, since in degraded PE this property tends to be increased.

**Conclusions:** Based on the results obtained it is concluded that PE and PP were able to be recycled and have properties that allow them to be used in the production of new products.

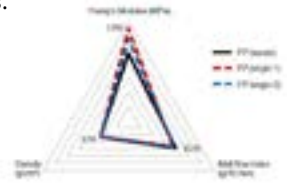

**Figure 1:** Modulus of elasticity, melt flow index and density for the PE wastes and for virgin polymers marketed by Braskem® (grades ML3602U and ML3400N).

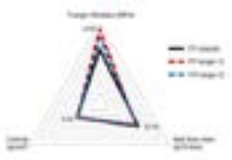

**Figure 2:** Modulus of elasticity, melt flow index and density of the PP wastes and of virgin polymers, also marketed by Braskem® (grades HP 550R and EP448R).

## Biography

Diego Piazza has completed graduation at Tecnologia em Polimeros from Universidade de Caxias do Sul (2007), Master's at Engenharia e Ciencia dos Materiais from Universidade de Caxias do Sul (2011) and Doctorate at Engineering from Universidade Federal do Rio Grande do Sul (2016). He is currently a Professor at the University of Caxias do Sul and has held the position of Coordinator of the Polymer Technology Undergraduate Course at UCS from 2011 to 2016. He works in the field of polymer nanocomposites, coatings, materials recycling and the processing of polymeric materials by injection, extrusion, thermoforming and rotomoulding. He participates in the UCS Entrepreneurship program. He integrates the group of researchers with The Ocean Cleanup (Holland) in the study of degradation and recovery of polymers from the marine environment. He has experience in the area of project development and research in the field of materials science and engineering, with emphasis on polymers, polymer materials processing, polymer nanocomposites, organic coatings, intelligent inks, powder paints, and materials recycling.

diego_piazza@yahoo.com.br