

4<sup>th</sup> World Congress and Expo on

# RECYCLING

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## Recyclability of polypropylene (PP) and polyethylene (PE) waste from the Hawaii coastline

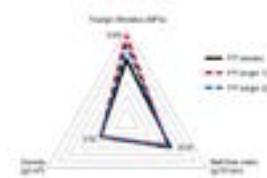
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**Introduction:** One of the major environmental problems is the ocean pollution. It is estimated that the oceans' surface holds more than 13.000 polymer fragments/km<sup>2</sup>. These fragments harm the fauna, since animals mistake polymers for food which leads to death of nearly 100 thousand marine mammals every year. Synthetic polymers are inert towards degradation, this way the material tends to accumulate in the oceans as a result of the huge consumption of polymers. This work aims to develop a methodology to recycle polymers found in oceans, comparing their mechanical and rheological properties with virgin polymers.

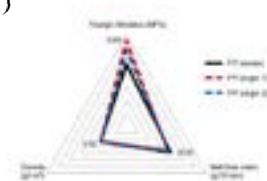
**Experimental:** The polymers employed in this work were collected on the beach sand of Kamilo Beach, Hawaii with the help of the Ocean Cleanup team. Among the collected polymers, higher amounts of PE and PP is highlighted. After cleaned and dried, they were ground in a knife mill. The resulting product had an average particle size distribution of 2 cm 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 20s for PE; 230°C, 2.16 kg and 10s for PP) tests.

**Results:** Data obtained for the modulus of elasticity and melt flow index for PP and PE waste had values close to those of the respective commercial virgin resins.

**Conclusions:** Based on the obtained results, it is concluded that although the polymers have been exposed to different weather conditions, PE and PP waste can be recycled and bear properties which enable them to be used in the production of new products.



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



**Figure 2:** Comparison of the properties assessed for PP with virgin polymers, marketed by Braskem® under the 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.

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