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Biodegradability of PHA-based composites in marine and terrestrial environments

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Composites based on polyhydroxyalkanoate (PHA) and natural fibres such as fibres of Posidonia oceanica (PO) and wood saw dust (WSD) were produced by extrusion in presence of appropriate amounts of plasticizer and filler. Thermal, rheological, mechanical and morphological characterizations of the developed composites were conducted. Their biodegradability was investigated in different environments: under simulated composting conditions in laboratory-scale (ISO 20200) and in soil for the PHA/WSD composites, because their expected fate is to be treated in composting plants or in soil for agricultural applications; in sea water on natural marine sediments (ISO 14852) in mesocosm and dune habitat for the PHA/PO composites, because their potential applications are in marine environment, such as natural engineering interventions (restoration of seagrass habitats). The presence of the fibres facilitated the disintegration of the PHA matrix and, consequently, accelerated its biodegradation both in sea water, dune, compost and soil. The developed composites resulted biodegradable in marine environment in a relatively short time and compostable in soil. Given the good results, the PHA/PO compounds were used for the production of pots and other items usable in the sea and sand dunes, such as transplanting tools and structures for restoration or protection of coastal habitats, and the PHA/SD compounds for the production of pots for terrestrial plants. The assessment of the effects of the pots on the development of marine/dental and terrestrial plants and microbial communities is in progress.

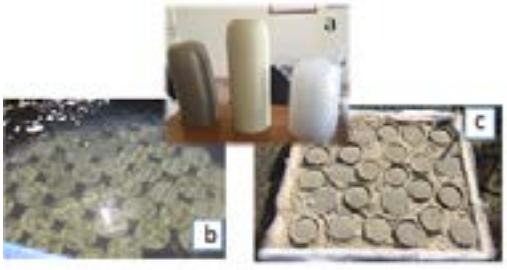

Figure 1: Pots made from PHA/PO compounds (a); pots containing marine plants in tanks continuously fed with sea water (b) and in dune environment recreated artificially (c).

Biography

Maurizia Seggiani is an Associate Professor of Industrial and Technological Chemistry. Her research activities are focused on analysis/optimization of chemical processes such as waste management (treatment/recovery/valorization of industrial solid/liquid/gaseous effluents), biomass gasification, green waste hydrocarbonization, and on the development of innovative materials such as solid sorbents for carbon capture at high temperature and biodegradable/compostable composites for applications in marine/land environments. In particular, in the last years she has been Coordinator of research projects concerning the development, processing and characterization of bio-composites based on PLA/PHA and natural fibres for applications in agriculture, packaging and marine environments.

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