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BOOKS OF ABSTRACTS

BIOCOMPOSITES BASED ON POLYESTERS AND NATURAL FIBRES

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Introduction

The use of “bio-polymers” for the production of “bio-plastic” and “Bio based composites” has become worldwide an assessed priority with the aim of reducing dependence from petro sources, and handle the concern for disposal of waste generated from not degradable plastics. Their use has attracted interest of various application sectors ranging from packaging to automotive components and other high value applications, and has been from many year a main topic of research activity in our unit, bound to several related European and Regional projects (PHA- ARFAS 2007-2013). Advantages of natural fibres on conventional reinforcements such as glass and aramid fibres are their relative cheapness, ability to recycle, and competition with them in terms of strength per weight of material. However the strength of the bond between fibres and matrix is substantial for the best mechanical performances of a composite. Many factors interacting with each other affect the complex process of the fibre/matrix adhesion.

Material and Methods

Bio-polyesters such as polylactic acid and polhydroxyalkanoates (PHAs) have been addressed as polymeric matrices for the production of biobased composites with natural fibres such as wood, ramie, cellulose, wheat, potato, peas, and posidonia oceanica. Materials were processed both in laboratory and in industrial scale and extensively studied for morphological, thermal and mechanical properties. Degradation in different environment (compost, soil, marine water) was also addressed coupled with study of products environmental sustainability by Life Cycle Assessment.

Results and discussion

Composites based on PLA or PHAs and different natural fibres up to 30% by weight was achieved on industrial scale with increasing of elastic modulus and impact energy-absorbing capability related to increasing the fibres content. Several mathematical models were applied to fit the experimental trends as a function of composition. Degradability in compost, soil, and in the case of PHAs based composites also in marine water, was promoted by natural fibres presence. Sustainability is also improved by carbon balance due to the use of biobased polymers and bio based natural fibres, as well additives introduced in the materials, such as plasticizers were selected giving preference to biodegradable and bio-based products.