

Subject : Recycling of Painted Plastic Automotive Parts from End-Life Vehicles

Duration : 6 months

Monthly Allowance : 417 €

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Abstract :

Every year, end of life vehicles generate between 8 and 9 million tonnes of waste in Europe, among which polymers represent an increasing part. In this context, a particular attention has been devoted to the recycling of bumpers and in particular to bumper-to-bumper recycling technology. In most of the case, those parts are composed of thermoplastics and in particular, of thermoplastic olefins. Thermoplastics, which represent 80% of the production of plastics, can, in principle, be mechanically recycled for a number of times. Indeed, in theory, they can be transformed from the molten state to solid state indefinitely without any degradation of the molecular structure. However, thermoplastics are rarely pure and for many applications, additives or surface treatment are required to achieve the needed properties: thermal stability, impact resistance, appearance properties.... The presence of these "contaminants" can render the process of mechanical recycling difficult. In the case of bumpers, painting is widely used in order to enhance aesthetic appearance of cars and hereby improve their customers appeal and marketability. One of the major issues related to this particular case concerns the fact that the presence of this contaminant led to the formation of numerous surface defects and to a modification of the mechanical properties of the polymer so it is not feasible to use the material for the same purpose.

In this context, the objective of the research project is the development of new methods for the mechanical recycling of painted plastics from car bumpers. Several pre-recycling operation will be tested and studied, including glycolysis. Glycolysis involves treating waste plastics by a mixture of glycol, at a certain temperature and optionally in the presence of catalyst. This leads to the degradation of the polymer that composes the coating and thus the effect of paints on the thermoplastics composing the bumper are lower. A full characterization of the morphology and mechanical properties of materials obtained will be carried out.

This study takes place within the framework of a project funded by ADEME (French Environment and Energy Management Agency) including partnership with industries.

Techniques used:

The techniques to be employed will include polymer processing (extrusion, press...), mechanical characterization of materials (tensile and impact properties) and characterization techniques (SEM, NMR, TGA, DSC).