TREAT MIXED WASTE PLASTICS: CHEMICAL REENGINEERING

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Abstract: Plastics are used and collected after use in a highly mixed state, which restrict them from economical mechanical recycling. Single-used plastics (SUPs), mainly polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET), make up more than 2/3 of all plastics. They have the shortest service lives and therefore give the most urgent pressure to the environment. Herein, (1) thermochemical foaming of polyolefin (PO) blends with ammonium polyphosphate (APP) is applied to directly convert PE and PP mixture into potential flame-retardant foams. The evolution of porosity of PP/APP blend follows the law of exponential growth. In contrast, the porosity of POs/APP blend follows the law of logarithmic growth. The constitution, structure and mechanical performances are carefully studied to reveal these differences. (2) a novel graft copolymer is synthesized, characterized and used to increase the elongation at break of the ternary plastic alloy (PE, PP and PET) by more than 7000%, which shows great potential for processing mixed plastics in large-scale. (3) maleic anhydride grafted polypropylene (PP-g-MAH) and organic modified montmorillonite (OMMT) are used for ternary plastics and their mechanical performances are studied for the additive manufacturing applications. (3) the carbon aerogel monoliths (CAMs) based on (waste) polymers are introduced, including the raw materials, preparation methods, applications, properties and improving methods. In general, mixed wasted polymers can be directly converted into useful materials. This promising approach for huge amount waste polymers can be named as “Chemical Reengineering”.

Keywords: waste polymers; waste plastics; mixed; mater recycling; chemical reengineering