

# RECYCLING & WASTE MANAGEMENT

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## A new route for difficult-to-recycle plastics: Thermosets and composites

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Thermosets, elastomers, soft foams, rubbers, fiberglass and other polymeric matrix composites are generally considered difficult-to-recycle materials because of the network structure of organic macromolecules. In the best case, after grinding, particles and granules are used as fillers for new mixtures and blends. For example, end-of-life tires are ground to separate rubber, harmonic steel, and textiles. Rubber granules are used to produce parts by adding a polyurethane binder whereas rubber powders are used for rubberized asphalts. In other very rare cases, the organic matrix is evacuated to recover fibers and other fillers. Otherwise energy recovery seems to be the only possible convenient strategy for those materials after disposal. However, recent achievements have shown that a new recycling strategy is possible also for this class of difficult-to-recycle plastics. By setting the grinding process,

it is possible to provide new reactivity to ground powder and granules. That has been shown in the European Project SMART (Sustainable Moulding of Articles from Recycled Tyres) where industrial products have been made by using 100% recycled rubber from tires without any additive or linking agent. The same concept has been extended to many other materials with similar network structure: fiberglass, polyurethane foams, MDF (medium density fiberboard), PCBs (printed circuit boards). From a recycling point of view, a primary route is not possible as recycled materials cannot be processed with the same machines of virgin ones. Nevertheless important engineering properties are obtained in those recycled products which can be effectively used in many industrial fields.

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