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New Approaches for Polymer Recycling

Milan Kracalik
Johannes Kepler University Linz, Australia

Statement of the Problem:

Polymer recycling is a way to reduce environmental problems caused by polymeric waste accumulation generated from day-to-day applications of polymer materials such packaging and construction.

Aim:

Polymer recycling has become a critical issue of academic as well as industry discussions in the last years. One of critical issues is recycling of the car tires. There are at least 300 million tires on deposit in the United States and this amount is increasing continuously. In 1990, only 17 % of produced tires have been recycled. In the meantime it is possible to find the market for nearly 78 percent of used tires. However, the rest of used tires end on registered or illegal deposits or land disposals. Furthermore, it is estimated that only less than 10% of waste rubber is reused into new product (physical recovery), i.e. the main part of collected rubber is used for thermal or chemical recovery. The main problem of physical recovery consists in rubber crosslinking i.e. it is not possible to process it again into new products.

As the chemical devulcanization methods are very time consuming as well as expensive, there is a need to find an effective mechanical devulcanization technology in order to support physical recovery, which is industrially attractive. Physical recovery approach can be also combined with nanotechnology, which is one another topic with continuously growing industrial interest. Nano composites made of polymers and layered silicates (clays) by melt mixing are of great interest for both industrial and environmental points of view because of increasing effort to develop new tailored materials and also to recycle the growing volume of polymers especially in packaging field.

Findings:

In this work, two examples of efficient polymer recycling using physical recovery for thermosetting as well as thermoplastic materials are presented: new approach for mechanical devulcanizationof care tires and for increasing the process ability of PET waste.

Note: This research was partly presented at Current Trends in Recycling and E-waste Management scheduled during May 04-05, 2020 at Vienna, Austria.