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## Degradable thermosets based on labile bonds or linkages: a review

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### ABSTRACT

Compared with thermoplastic polymers, thermoset polymers are difficult to recycle because they can not be remolded once cured and often do not decompose under mild conditions. Thermosets designed to be degradable afford a useful route to obtain thermoset recyclability and enable the recycling of valuable components that may be encapsulated in thermoset materials. In this review, the need for degradable thermosets as well as a summary of research progress is presented. Degradable thermosets are divided into different categories based on the different labile bonds or linkages studied such as esters, sulfur containing linkages (disulfide, sulfonate, 5-membered cyclic dithiocarbonate, trithiocarbonate, sulfite), nitrogen containing structures (acylhydrazone, alkoxyamine, azlactones, Schiff base, hindered ureas, aminal, carbamate), orthoester structures, carbonates, acetals, hemiacetals, olefinic bonds, D-A addition structures, vicinal tricarbonyl structures, peroxide bonds, phosphorus containing structures, tertiary ether bonds, and so on. The synthetic route, recycling methods, degradation mechanisms and progress in research of each approach to degradable thermosets is described. The efforts of the applicability of some degradable thermosets are also summarized. Finally, conclusions and trends of future work are highlighted.

**Keywords:** cross-linked polymers, recycling, controlled degradation, triggers, decomposition

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