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Smart nanocomposites based on thermally reversible networks

Francesco Picchioni

University of Groningen, The Netherlands

The use of nano-fillers in thermally reversible networks constitute and easy as well as extremely attractive route to smart nanocomposites. In particular, the Diels Alder reaction between furan and maleimide derivatives has been extensively reported for the preparation of nanocomposite materials that exhibits heat or electricity induced self-healing, shape memory and possibility for cradle-to-cradle recycling. The covalent nature of the Diels-Alder adducts ensures relatively high glass transition temperatures, while its reversible character provides the necessary dynamic character that ensures the possibility for self-healing and shape memory effects. In the present work, we will start by briefly illustrating the wide variety of substrates suitable for modification with Diels-Alder active groups and their self-healing behavior. Against this backdrop, the special case of nanocomposites will be illustrated as paradigmatic example for the possible use of this interaction also between a polymeric matrix and a filler. In particular, the use of carbon nanotubes as filler paves the way towards shape memory materials as well as electricity-induced self-healing.

Speaker Biography

Francesco Picchioni obtained his PhD (2000) in Polymer Chemistry at the University of Pisa (Italy) on a project dealing with thermoplastic rubbers. After 3 years postdoc at the Technical University of Eindhoven (on a project about "solid state modification of polypropylene"), he joined in 2003 the University of Groningen first as assistant professor and then associate (2007). Since 2013. He is full professor in Chemical Product Engineering. He is (co)author of about 90 papers in peer-reviewed journals and 4 patents.

e: f.picchioni@rug.nl

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