Abstract - NanoInnovation 2025

Ainhoa Tolentino Chivite, PhD (CEO and Co-founder at ONYRIQ)

Title: Chemically recyclable thermosets based on cleavable hardeners

In the study field of Circular Economy and Sustainability, ONYRIQ has developed a technology called LOOP, consisting of a platform of polymer resins that are completely recyclable. This approach is used in the REPOXYBLE EU project to create a fully recyclable epoxy composite which, upon depolymerization of the resin into reactive building blocks, enables the recovery of existing functional additives and reinforcing fibers. Using proprietary cleavable hardeners and commercially available epoxy resins, depolymerizable polymers are created. These resins can then be combined with specific fibers and functional additives leading to epoxy thermoset prepregs and composites by energy-efficient manufacturing techniques. The resulting composites, intended for use in automotive and aerospace applications, have achieved required thermomechanical properties and demonstrated their recyclable nature when exposed to acidic aqueous media, where reactive building blocks and components have been recovered, establishing a circular recycling system.

As part of its route to market, the technology needs to validate its industrial transfer, by means of an IP protection strategy and scaling up feasibility exploration, within a collaborative context of open innovation with other companies and universities. In order to increase the potential and possibilities of chemically recyclable systems, new applications are presently being assessed within European project frameworks (i.e. FURHY, ECORES-WIND). Consequently, a platform of solutions is being developed that aims to employ depolymerizable resins in additional industries (such as wind power or construction), through different production techniques (prepreg, infusion, etc.), and for its use as coatings or composites.