Research Doctorate (Ph.D.) in Chemical Sciences
34rd Cycle – Academic Year 2018/2019

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Project Information

1 - Title
Molecular approach for the study and development of advanced material, with high mechanical resistance, and self-healing properties.

2 - Key words
Toughness, mechanical strength, Thermosets, Self-healing, Viscoelastic properties.

3 - Abstract
The aim of the project is the study and development of novel thermosetting polymers with self-healing properties containing non-conventional fillers, such as alkyl and/o aryl poly-ketone resins, which are functionalized with furfurylamine and/or 1,2-diaminopropane and containing maleidimide, or polybenzoxazine based resins which are reticulated using functionalized carbon nanotubes, or containing high melting temperature homo- and co-polymers possessing good mixing properties with conventional phenol-formaldehyde resins (polyamides, polyurethanes, polyesters etc.). The rheology and viscoelastic properties of these systems (alone or in mixture with other thermosets plastics) will be studied as a function of their molecular structure and compared with those of commercial resins (such as phenol/hexamethylenetetramine) normally employed in a widespread application fields including automotive, constructions, electronics. The molecular basis driving complex phenomena associated to friction and chemical and physical wear of resins surface by effect of contact with other surfaces in motions will be clarified, in presence and absence of lubrificating agents, developing methods to obtain reliable and reproducible results, and build up structure-properties relationships for these systems (nanotribology).