

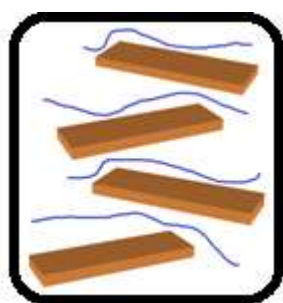
PhD thesis abstract

Nanocomposites based on thermoset

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The thesis "**Nanocomposites based on thermoset**" aims the synthesis of new advanced hybrid materials that are included in the class of nanocomposites based on thermoset matrix and layered silicates. These materials are characterized by superior properties than conventional polymer based composites.

The **research directions** developed during the PhD stage involve:



- Synthesis and characterization of new thermosets (epoxy, benzoxazines)
- Synthesis and characterization of new polymer-clay based nanocomposites
- Studies of organophilic clay exfoliation mechanism
- Application of nanocomposites in coatings

Innovative strategies for increasing the compatibility of hydrophobic organic matrix (epoxy and benzoxazine resins) with hydrophilic layered silicates (montmorillonite) were developed in order to induce the exfoliation of individually silicate layers into the polymer matrix.

The polymer-clay based nanocomposites were characterized through the investigation of several factors that influence the formation of exfoliated structure: type and concentration of organophilic agent, cationic exchange capacity of silicates, thermal stability of organophilic silicates and the interactions of polymer matrix with organophilic silicates.

The study of exfoliation mechanism of layered silicates within polymer matrix was performed to understand the relationship of structure-property-application.

The prepared nanocomposite materials were proposed and tested as multifunctional additives in the coatings field.

During the PhD stage, I have gained experience in the following fields:

- ❖ synthesis, purification and characterization of thermosets (epoxy, polybenzoxazine)
- ❖ thermal polymerization of benzoxazine and monitoring the crosslinking process by different techniques
- ❖ kinetics studies for crosslinking process of thermosets using Differential Scanning Calorimetry (DSC) and FTIR Spectroscopy
- ❖ chemical modification of layered silicates with polymer and low molecular weight organic compounds.
- ❖ preparation of new polymeric nanocomposites
- ❖ advanced characterization of polymer-clay nanocomposites using FTIR, DSC, SEM, TEM and dynamical mechanical analysis