New Hybrid materials based on polymers and alumino-silicates

Author: **Dr. Eng. Adi Ghebaur**

Mentor: Prof. Dr. Eng. Horia Iovu

The main aim of the present study was the synthesis and characterization of new hybrid materials based on thermoreactive polymers, thermoplastic polymers or dendritic polymers and layered aluminosilicates. First purpose of this research was to monitored the influence of silane agent used to reduce the hydrophilic state of HNT and the modified clay concentration concerning reactivity, thermostability, glass transition temperature and the morphology of hybrid materials based on epoxy resin/unsaturated polyester resin. Also was studied the influence of PAMAM dendrimer generation and the cation exchange capacity (CEC) of montmorillonite on the interaction type between the two components. The presence of 1635 cm-1 peak observed in modified silicates FTIR spectra demonstrates the presence of molecule water between the layers due to the "frustrate" intercalation that took place. The same conclusion emerges from the thermogravimetric analysis were the weight loss of water molecules between the layers is smaller. XRD results confirm that the modified silicates dendrimers shows a small interbasal distance increase regardless of PAMAM generation and inorganic host CEC value. These results are in agreement with TGA, FTIR and TEM results. Hybrid materials composed of PAMAM G3 have a larger amount of N 1s and C 1s atoms than those containing PAMAM G1, due to higher generation of dendrimers and so a higher number on N and C atoms in the structure.

Further was followed the synthesis and characterization of organic inorganic hybrid materials with biomedical applications. Intercalation of vitamin B1 between MTM layers was demonstrated by XRD, FTIR and TGA. Because MMT-K10 has a CEC value lower than MMT-Na a lower quantity of drug was intercalated. With UV-VIS analysis was monitored the influence of reaction time contact, temperature reaction, pH and initial drug concentration on the vitamin B1 adsorption process onto HNT. The experimental results were fitted in three mathematical models, Langmuir, Freundlich and Dubinin-Radushkevichiso isothermal adsorption and it was shown that the physical adsorption occurs and the process is favorable at lower temperatures. The coating of HNT – DPH with PVA reduce the quantity of drug release in 24 h. Polymer clay coating was demonstrated by SEM analysis observing a very good compatibility between the two components.