NANOMATERIALS FOR WATER TREATMENT

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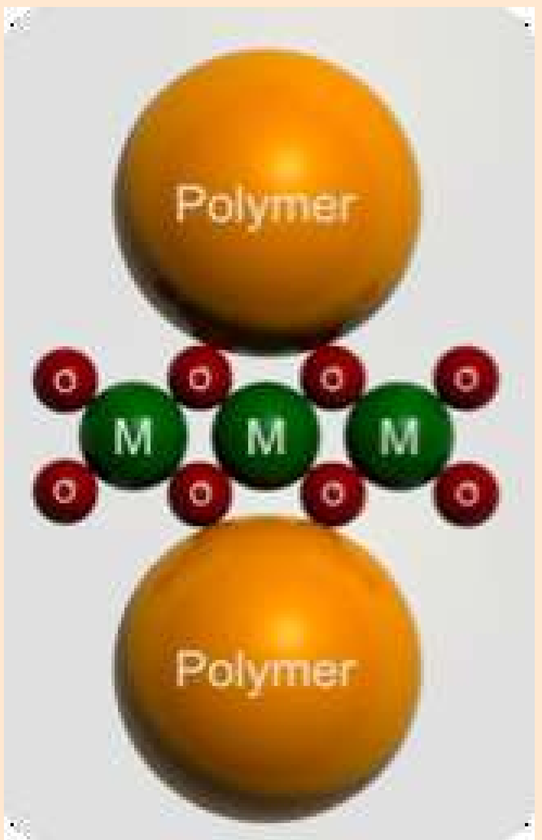
Problem.... EUTROPHICATION

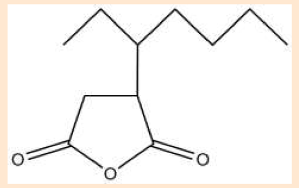
Among many inorganic nutrients requires for plants growth, phosphorus is one of the principal limiting nutrient. Excessive nutrients concentration have effects on biology, chemistry and human use of lakes and rivers. Eutrophic water bodies have in general aesthetic problems, undesirable odor, color and taste. In severe cases toxins might also be present in the water resulting from the dominance of phytoplankton by blue-green algae (cyanobacteria), whereas some of these produce compounds more toxic than cobra venom.

SOLUTION

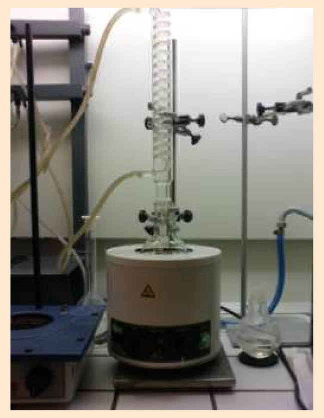


Hybrid polymers, combine organic and inorganic structures at the molecular level to form a nanocomposite with specific properties. The present work aims to develop a hybrid nanocomposite, which contains inorganic particles able to react with phosphorus. Polypropylene grafted with maleic anhydride (PP-g-MA) and aluminum isopropoxide ($Al(Pr\text{-}i\text{-}O)_3$) were used to prepare a hybrid polymer using a sol-gel reaction.

Hybrid Preparation and Characterization

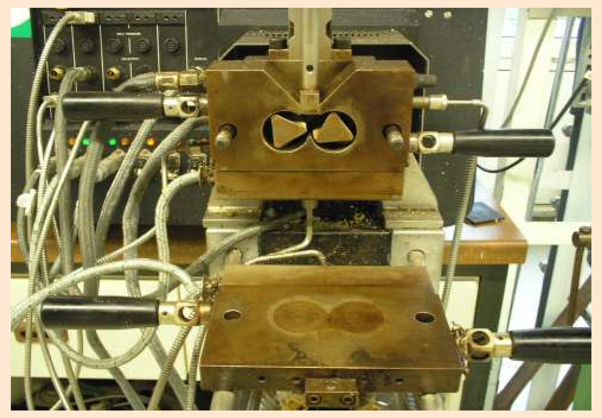
Materials	Grade	Chemical structure
PP modified with MA	HP502N (BASELL)	 
Aluminum isopropoxide $Al(OC_2H_5)_3$	Aldrich	

Solution



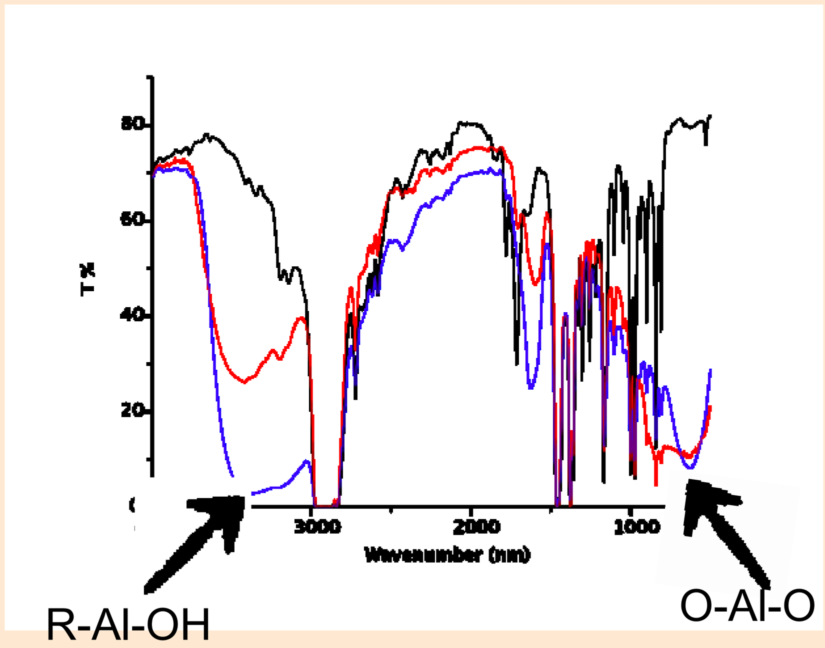
Acid catalyze at ebullition point of toluene during 10 min

Melt

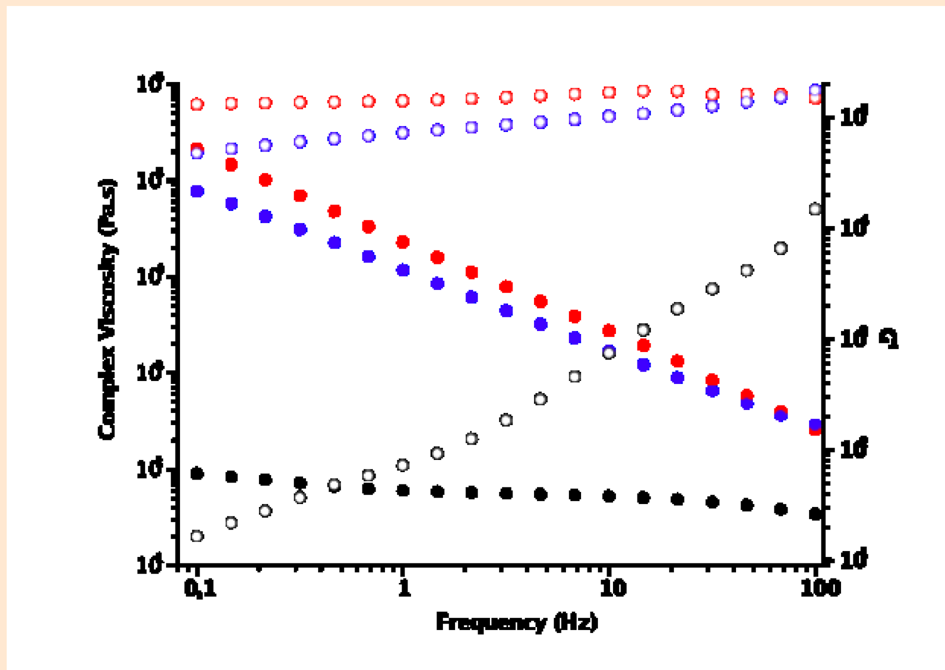


At 180 ºC, 50 rpm during 10 min

Results



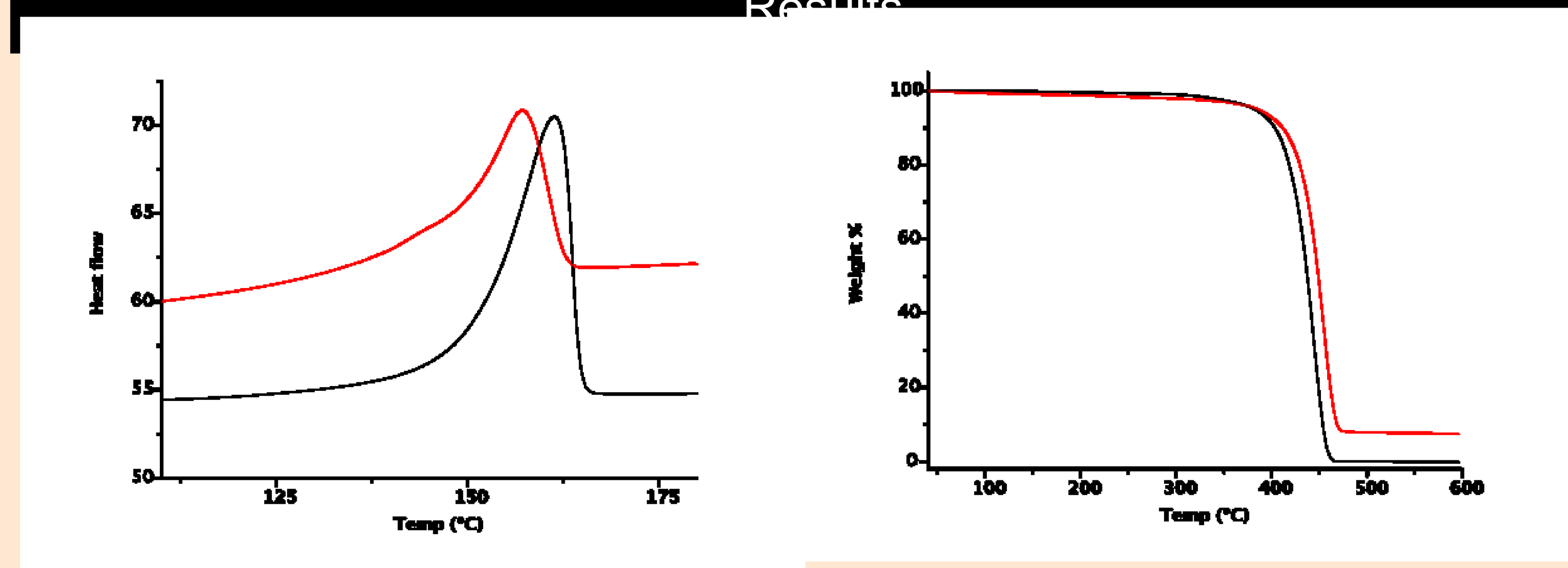
FT IR spectra of PP-g-MA and nanocomposites



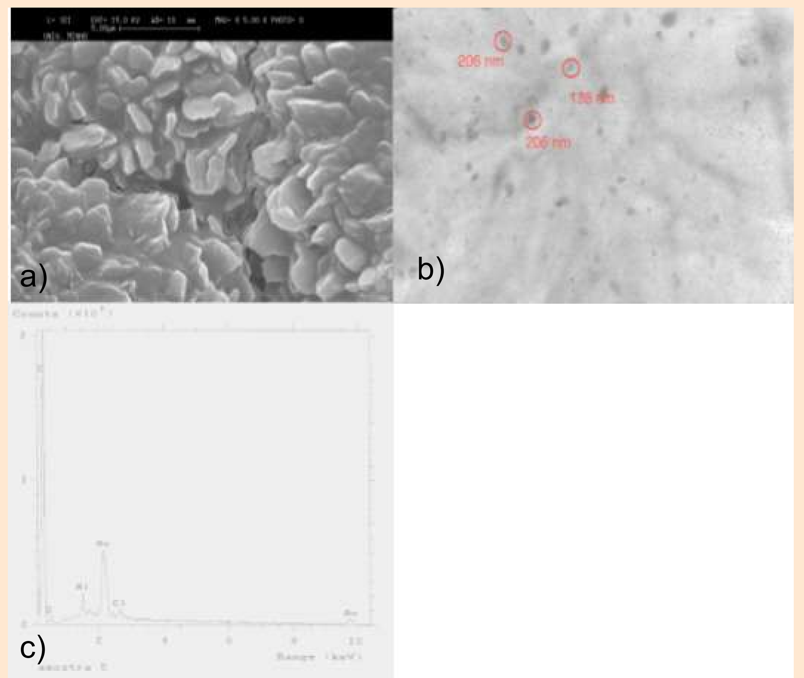
Complex viscosity and G' of PP-g-MA and nanocomposites

—— PP-g-MA —— PP-g-MA + 25% $Al(Pr\text{-}i\text{-}O)_3$ Haake —— PP-g-MA + 25% $Al(Pr\text{-}i\text{-}O)_3$ Solution

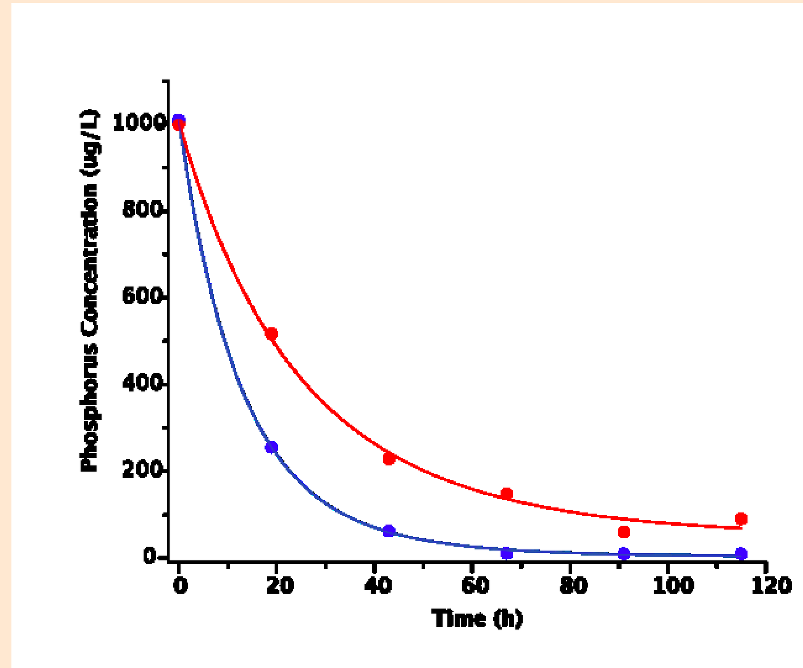
Results



DSC and TGA of PP-g-MA and nanocomposite



a) SEM, b) TEM microphotographs of the nanocomposite and c) EDX



Removal capacity as a function of time

Conclusions and Implementation

- FT IR spectra depict the formation of Al-O and Al-OH;
- Complex viscosity and storage modulus values increase;
- Thermal stability increasse and crystallinity degree decreases;
- Al^{3+} nanoparticles well distributed were obtained;
- The develop materials showed high efficiency to remove phosphorus from water.