



Development of a new sustainable material from the ashes produced by a fluidized bed mono-combustion plant of biological sewage

PhD Candidate: Praveena Pachaiappan

Email: p.pachaiappan@studenti.unibs.it

XXXVIII Cycle

Tutor: Prof. Elza Bontempi; Prof. Carlo Punta



Background

Sludge derived from the drinking water treatment consists of wastes which needs to be valorised in a sustainable way. The MM SpA company is able to valorise the sludge by mono-combustion providing ashes as end product. These ashes result to have a high content in Phosphorus, which is a crucial element for food security, but it is under supply risk. For these reasons, ashes waste can be considered an alternative source for this element.

Objectives

This project will mainly focus on the development of new sustainable materials and composites by combining ashes produced by MM SpA company and cellulose-based products derived from waste biomass. The final products, designed to minimize the ecotoxicological risks, will be tested as new fertilizers carriers and also as sorbent materials for water decontamination.

Methodologies

- Extraction and production of nanocellulose from biomass and formulation of new nanostructured composites in combination with ashes derived from mono-combustion process. for the use of fertilizers and adsorption.
- Minimization of ecotoxicity by microwave-assisted ashes' pre-treatment technology.
- Eco-design of the material from both the process and the product point of view also by LCA analysis.
- Use of newly developed materials as fertilizers' carriers and adsorption systems for water decontamination.

Expected Results and Impact

The newly formed materials will be the company's value-added product in the marketplace. The products would create an improved knowledge on the ashes' valorisation. These materials are expected to prove the framework of circular economy concept by valorising the waste to design up-scaled products. Thus, the expected results could have a significant impact both from an economical and a social point of view.