

Project entitled:

Influence of polyester fiber and chemical finishing agents on thermally-assisted acidic hydrolysis of natural fibers containing cellulose and protein

The global demand for textiles (clothing, decorative and utility fabrics, etc.) is growing steadily, and this trend looks likely to continue. Global production of textile materials was around 85.5 Mt in 2013 and by 2025 is estimated to rise to 130 Mt. As much as 63% of the textile fibers currently sold are derived from petrochemicals and only 37% from natural fibers, mainly cotton (24%), wool or linen. Moreover, many chemical substances are used to impart functional features to the material (such as water-resistance, flame-retardancy, resistance to creases), which often prevent its natural biodegradation, in part because they inhibit the growth of microorganisms (fungi, bacteria, etc.). Textiles thus constitute a significant group of wastes which are difficult to biodegrade in the natural environment. The main goal of the current project is therefore:

To develop a model procedure for thermally-assisted acidic hydrolysis of model textile materials based on cotton and wool with the addition of polyester, which will make the textile materials biodegradable or produce a valuable fermentation medium. The developed procedure will be implemented for the hydrolysis of real textile waste.

The research will be divided into five tasks, which will contribute towards the development of a procedure for acid hydrolysis of textile waste. The hydrolysates will be suitable for use in fermentative media (and therefore biodegradable).

Task 1: Designing, manufacturing and chemical finishing of model cotton and wool fabrics with or without the addition of polyester;

Task 2: Identifying the composition of textile waste and preparation of the material for hydrolysis processes;

Task 3: Investigation of thermally-assisted acidic hydrolysis of model fabrics and textile waste;

Task 4: Qualitative and quantitative analysis of the composition of sugars and amino acids in hydrolysates of model fabrics and textile waste;

Task 5: Assessment of the suitability of hydrolysates of model fabrics and hydrolysates of textile waste as a fermentation medium.

The tasks may be summarized as follows:

