VALORISATION OF END-OF-LIFE MATERIALS IN THE PRODUCTION OF VALUE-ADDED CONSTRUCTION MATERIALS

Abstract

Author: eng. Cristina Lucreția VĂDUVA (DIMA)
PhD supervisor: prof. dr. eng. Alina BĂDĂNOIU

The main objective of the doctoral dissertation is the obtaining and the preliminary characterization of some construction materials with thermal and/ or sound insulation properties in the composition of which different types of municipal and/ or industrial end-of-life materials (waste) have been valorised.

Since the use of end-of-life materials (waste) as alternative raw materials in various industries, along with the rapid decline of natural resources become global priorities, this thesis brings new information in terms of obtaining and assessing the main characteristics (composition, microstructure, properties) of three categories of materials with wastes content; the studied materials, with enhanced thermal and / or sound insulation properties, are: i) portland cement-based materials with the addition of polyurethane waste and chopped electrical cables; ii) materials based on calcium sulphate with the addition of waste rubber or polyurethane, flue gas desulfurization gypsum (FGD gypsum), chopped electrical cables or ash resulted in the combustion of hydrocarbon-containing residues from petroleum industry; iii) waste-based materials obtained by the alkaline activation of waste glass powder with slag, rubber and polyurethane addition.

The studied materials with waste content have a high porosity due to: i) the nature of the used waste, ii) release of gas in the reactions between the components, iii) heat treatments; or iv) the addition of substances which entrain air into the fresh paste or mortar, during the mixing the components. Due to the porosity increase, this type of materials has good thermal and acoustic insulation properties, close in value, in some cases, to those of classical materials currently used in construction field.

The results obtained in the framework of this doctoral dissertation can be summarised as follow: (i) complex characterisation of the studied wastes, in terms of composition (oxide and mineralogical), particle size distribution, microstructure and density; ii) assessment of the influence determined by chemical or thermal treatments of waste, on the main properties of the obtained composite materials; iii) design of compositions with different dosages of various types of waste, as a first step in the production, at laboratory level, of the composite material prototype product, with applications for thermal and sound insulation of various construction elements.