# Phosphate cements based on calcined dolomite. Obtention, properties and utilizations

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*Abstract*

The main objectives of this doctoral thesis were the obtention of magnesium phosphate cements and calcium magnesium phosphate cements and their utilization as matrices for the immobilization of wastes with a high content of heavy metals. Also, in the framework of this thesis was evaluated the ability of these cements to be used as passive fire protection materials.

The magnesium phosphate cements and calcium magnesium phosphate cements were obtained by the mixing of magnesia resulted from the calcination of magnesite at 1500°C or dolomite calcined at different temperatures (750°C, 1200°C, 1400°C), with solutions of potassium phosphates ($KH_2PO_4$ and $K_2HPO_4$) or solution of sodium dihydrogen phosphate ($NaH_2PO_4 \cdot 2H_2O$) and other components.

The composition of studied phosphate cements, after hardening, was assessed by X-ray diffraction and EDX analyses and their microstructure was assessed by SEM analyses. The main properties determined on these cements were: setting time, compressive strength and tensile adhesion strength to types of support (ceramic and metal).

To assess the ability of magnesium phosphate cements and calcium magnesium phosphate cements to immobilize toxic wastes, two types of waste were used: an industrial waste with high chromium content and a simulated waste with nickel content. The leaching test results confirmed an adequate immobilization of both chromium waste (for a waste dosage corresponding to 0.5% Cr) as well as of the nickel waste. The influence of these wastes on the hardening processes of the studied cements was also assessed.

The ability of these cements to form coatings which could efficiently protect the steel structures in the event of a fire was also studied. The tests showed that phosphate cement coatings have a good adhesion to the steel substrate and effectively prevent the increase of the temperature of metal substrate over 500°C (considered as critical for steel structures).

Keywords: calcined dolomite, magnesia, phosphate, heavy metal waste, immobilization, passive fire protection