

# The exploitation of a local raw material dolomite to prepare magnesium phosphate cements

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## Abstract

Starting from a local raw material dolomite, phosphomagnesium cement which quickly hardened at room temperature was usefully prepared. Under controlled conditions dolomite was partially calcined, to obtain a mixture of magnesium oxide and calcium carbonates (MgO, CaCO<sub>3</sub>). This mixture was then used to form phosphomagnesium bond after addition of different compounds such as: MgCl<sub>2</sub>, MgSO<sub>4</sub>, NH<sub>6</sub>PO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>·10H<sub>2</sub>O and H<sub>2</sub>O with different percentage. Two preparation procedures have been adopted. In the first procedure MgCl<sub>2</sub>, NH<sub>6</sub>PO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>·10H<sub>2</sub>O and H<sub>2</sub>O were used. While in the second procedure MgSO<sub>4</sub>, NH<sub>6</sub>PO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>·10H<sub>2</sub>O and H<sub>2</sub>O were chosen. This last procedure gave the best result. Different techniques were used to investigate the physical properties of these cements such as: XRD, FTIR, DSC and tensile strength. The results obtained show that these cements hardened in 15 to 20 min, with a density between 1.67 and 1.69 g/cm<sup>3</sup>, and a tensile strength between 1.84 and 2.35 Mpa, comparable and even better than that found in the literature. The analysis of these cements shows the formation of Struvite phase in the case of cement prepared with the first procedure, while both struvite and Mg(PO<sub>2</sub>)<sub>4</sub>·4H<sub>2</sub>O phase were detected in the case of the cement prepared following the second procedure. The two cements can support a heat treatment up to 70 °C after which they become to decompose. The results show that these cements can be used at lower cost in the place of existing cement on the market.

**Keywords:** Phosphomagnesium cement, struvite, dolomite, partial calcinations.