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Cementing mechanism of potassium phosphate based magnesium phosphate cement

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Abstract

Magnesium phosphate cements (MPCs) are materials that belong to chemically bonded ceramic materials. They have a wide range of potential applications, due to their superior performance. In this paper, the reaction products and cementing mechanism of magnesium phosphate bonded cement based on the dead burned magnesia and the mono-potassium phosphate (MPP) are investigated. Fine powder and grains of dead burned magnesia were used to prepare pure cement paste and bonding cluster samples, respectively. The cement reaction products and their micro-morphology in the both different samples are examined. The microstructure of specimens is analyzed by SEM, TEM, XDR, and optical microscopy. Struvite of potassium ($\text{MgKPO}_4 \cdot 6\text{H}_2\text{O}$) is observed in the reaction products. According to the analysis, it is found that struvite exists in both crystalline and amorphous form. There is also residual magnesia in the

hardened cement paste. By means of microscopy observation, it can be seen that reaction products form around the unreacted magnesia and can develop into a continuum structure, which further produces the hardened paste. Struvite can grow up to form the more perfect crystal in a long term curing age, if large enough space is available during the hydration process.



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Keywords

Magnesium phosphate cement; Microstructure; Microscopic analysis; Reaction products

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