



No MgO Outgassing

Technical Report

MALP Concretes do NOT Outgas

Unlike older generation MAPC (Magnesium-Ammonia-Phosphate-Cement) Concretes, MALP (Magnesium-Alumino-Liquid-Phosphate) Concretes do NOT Outgas, and bond well to sealants and coatings, including silicone, epoxy, methacrylate, urethane, and silane. Phoscrete with MALP+ technology can accept sealants and coatings as soon as one hour following initial set.

Reaction mechanism of MgO with ammonium di-hydrogen phosphate in water versus MgO with mono-aluminium phosphate solution

In a water solution, ammonium di-hydrogen-phosphate dissociates and enters into a reaction with MgO. On mixing, an exothermic reaction takes place with some initial loss of ammonia.

The reaction leads to the formation of "Schertelite" $\text{Mg}(\text{NH}_4)_2(\text{HPO}_4)_2 \times 4 \text{H}_2\text{O}$ at first. However, in presence of water and depending on the quantity of water available in the matrix of the material, a further reaction occurs to the more stable mineral "Struvite" $\text{Mg} \text{NH}_4 \text{PO}_4 \times 6 \text{H}_2\text{O}$. Due to a change in the Mg / NH_4 ratio from 1:2 to 1:1 during this reaction, it can be assumed that some "off gassing" takes place over time.

As a result, there are two "off gassing" mechanisms that take place during the formation magnesium phosphate – first during the exothermic reaction and then during a curing period after setting.

In contrast, the reaction between magnesium oxide and mono-aluminium phosphate in solution can be described as follows:



The above stoichiometric reaction only happens in excess of MgO. This means in presence of water also this reaction is not totally in equilibrium and more MgO gets consumed over time during curing. Tests have shown that the final product always results in "Newberite" $2\text{MgHPO}_4 \times 3\text{H}_2\text{O}$.⁽¹⁾

Therefore, "outgassing" does not occur in this type of acid base cement.

⁽¹⁾ T. Finch, J.H. Sharp. "Journal of Material Science" 24 (1989) 4379 - 4386