# Sub- and supercritical hydrothermal synthesis of PEG modified Calcium Silicate Hydrate nanoparticles.

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Silica and other Calcium Silicate Hydrate (C-S-H) nanoparticles have been studied as nanoadditions to improve mechanical properties of fresh cement pastes [1]. However, this kind of materials tends to form aggregates [2] and absorb a significant amount of water when they are used in cement suspensions. Due to this, the workability of cement mixes gets worse [3].

One way to avoid this, is increasing the water content in the mix, but a high-water content in the cement suspension reduces its mechanical properties as well. Nowadays it exists different polymer admixtures (superplasticizers), capable to reduce the water content in cement formulations. This work focuses on the dispersibility of C-S-H nanoadditions and its rheological properties enhancement in cement pastes with lower water contents.

In this study, the synthesis of C-S-H crystalline polymorphs modified by Polyetheleneglycol polymers has been carried out [4] following two different methods; batch subcritical [5] and continuous supercritical hydrothermal synthesis [6]. Both methods were compared to obtain Tobermorite (Figure 1a) and Xonotlite (Figure 1 b) crystalline structures. Furthermore, rheological and mechanical tests were performed to study the behavior of this kind of seeds in fresh cement pastes and early hardened cement probes.

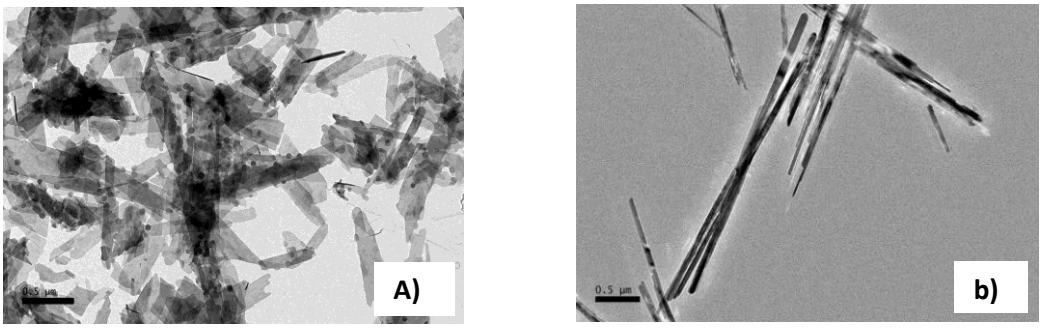


Figure 1: Transmission electron microscopy images of a) Tobermorite $Ca_5(OH)_2Si_6O_{16}{\cdot}4H_2O$ and b) Xonotlite $Ca_6Si_6O_{17}(OH)_2$ prepared by hydrothermal synthesis and modified with PEG.

References

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