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(54) **CELLULOSE NANOCRYSTAL ADDITIVES AND IMPROVED CEMENTIOUS SYSTEMS**

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(57) **ABSTRACT**

The invention provides a cement paste composition comprising cement, cellulose nanocrystals, and optionally water. The cellulose nanocrystals can be present in an amount sufficient and effective to increase the flexural strength of cured cement prepared from the cement paste composition. The cellulose nanocrystals can also be present in an amount sufficient and effective to increase the workability of a cement paste prepared from the cement paste composition. The invention further provides a water reducing additive that reduces the amount of water required for desired workability of a cement composition. Use of the presence of the cellulose nanocrystals also results in an increased degree of hydration and cumulative heat evolution in comparison to a corresponding composition without the cellulose nanoparticles, thereby resulting in a higher total cure of the cement paste composition upon curing.

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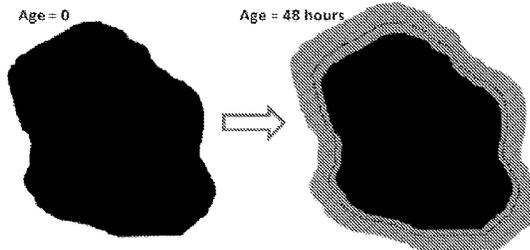
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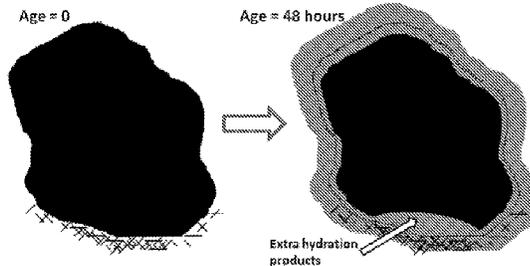
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A.



B.



- Unhydrated cement
- Hydration products
- Original contour of the cement particle
- CNC