

Nanofibrillated cellulose as nano-reinforcement for cementitious composites

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Cement is the world's most widely used building material; to reduce the environmental impact of its production different and more eco-friendly additives are being tested.

Natural fibres have been commonly used as a reinforcement phase in cementitious composites in ancient times and they are newly being considered as an interesting alternative, since, although they generally have a lower reinforcement effectiveness (e.g. compared to metal fibres), they represent a renewable, economical and abundant resource.

Cellulose nanofibres, in particular, have proved to have remarkable properties such as low density, very large surface to volume ratio, high surface area, good mechanical properties including a high Young's modulus, high tensile strength and low coefficient of thermal expansion¹. Their addition generally determines an increase in the mechanical properties of the cementitious composites especially in terms of flexural strength and toughness.

These characteristics would theoretically make them a suitable additive for traditional lime-based mortars. A lime-based mortar is the only choice when it comes to historical city centres, since the common Portland cement is not chemically and physically compatible with historical materials.

Further studies are then necessary to assess if and how cellulose nanofibres can positively affect the properties of traditional lime based mortars.

¹ Ardanuy, M. [et al.]. Nanofibrillated cellulose (NFC) as a potential reinforcement for high performance cement mortar composites. "Bioresources", 09 Juliol 2012, vol. 7, núm. 3, p. 3883-3894