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performance requested become the input for the design of the material – or multifunctional products – suitable for di erent applications (this is the case, for example, some mortars used for both structural restoration and nishing application) – results in the possibility of optimizing the material according to the needs of project and site, reducing time and costs of construction [31].

Nanostructured cementitious materials seem therefore to ensure an e ective response in relation to some parameters that characterize eco-e cient products, such as material and energy resources saving throughout the life cycle, a more rational use of raw materials [32,33], higher and more reliable performance in use compared to conventional products, a high durability that allows to reduce and simplify maintenance operations, as well as a peculiar response to environmental conditions (self-cleaning, self-monitoring, photocatalysis, etc.).

e comparison of the life cycle impacts between ultra-high-performance concrete (UHPC) and conventional reinforced concrete 1(, for example, shows a signi cant reduction in the consumption of material (about 6 times lower) and energy resources (around 40%), as well as lower emissions of greenhouse gases (about 50%). e environmental impacts in production and processing phases are lower

Nanotech Products

Nanosilica cement

Silica (SiO_2) is a common component of conventional cement mix, but the use of nanosilica particles leads to a material's micro and nanostructure more dense and viscous, thus improving workability and mechanical properties (compressive strength from 3 to 6 times higher) as well as reducing carbonation process. Nanosilica particles react with the calcium hydroxide released during cement hydration, thus increasing the amount of binder in the cement matrix. e addition of nanosilica (about 1.5% of weight) is generally made through admixtures and begins to be used for the realization of high performance concretes or cement mortars with high mechanical strength, workability and durability. Recently the use of nanosilica (diameter 5-50 nm) has been tested[14] as a VMA (Viscosity Modifying Agent) in SCC (Self Compacting Concrete) treated with mineral additives (ground limestone, y ash, etc.) [34].

Photocatalytic cement

Since the mid-'90s, the possibility of providing a contribution to air pollution reduction through the use of construction materials, such as glass and cement, containing photocatalysts has been explored. e addition of titanium dioxide nanoparticles makes the cementitious material hydrophilic and its surface self-cleaning. is particular feature also introduces antibacterial properties and the ability to degrade air pollutants must be added [35].

Under optimal level of lighting and photocatalyst's activity, it is estimated that 1000 m^2 of photocatalytic surface are able to clean an air volume of 200,000 m^3 per day (considering 10 hours of light per day). It is then possible to hypothesize that the treatment of about 15% of the external surfaces of buildings and roads would reduce signi cantly the level of pollution in urban environments. e indf4(t)-6(h)4(esize1(r23(v)-3(a)6dze)-p)-9(er uce)-18(sig)-36dze ooolveolVbi9enp3(s)-111

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Magnesium, in addition to these features, it is also a material readily available WKURXJK LQGXVWU\ UHF\FOLQJ SURFHVVHV ZKLFK DOVR KHOSV WR UHGXFH WKH LPSDFW GXULQJ H[WUDFWLRQ RI UDZ PDWHULDOV &XUUHQWO\ WKH JRDO LV WR DFKLHYH WKURXJK WKHVH SURFHVVHV D UHGXFWLRQ RI &2 HPLVVLRQV LQ WKH SURGXFWLRQ SKDVH XS WR 50%.

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11. Data have been collected and monitored from 2006 to 2007 by Italcementi and ARPA Lombardia.

7KH 7UDIRUR GHO 7ULWRQH LQ 5RPH KDV EHHQ RSHQHG DIWHU D PRQWK RI ZRUNV LQ September 2007. The project has been sponsored and developed thanks to an DJUHHPHQW EHWZHHQ 0XQLFLSDOLW\ RI 5RPH ,WDOFHPHQWL DQG &,0 &DOFL ,GUDWH 0DUFHOOLQD ZLWK DQ RYHUDOO FRVW RI ¼

13. Studies carried out by ARPA Lombardia (Regional Environmental Protection