TECHNICAL TEXTILES AS SUSTAINABLE BUILDING MATERIALS FOR VARIOUS STRUCTURAL AND GEOTECHNICAL APPLICATIONS IN CONSTRUCTION

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Abstract:

Textile Reinforced Concrete (TRC), Textile Reinforced Mortar (TRM), and Fabric Reinforced Cementitious Matrix (FRCM) use high-strength textiles in open mesh configurations within inorganic cementitious or lime matrices. These textiles are cost-effective, fire-resistant, and compatible with concrete and masonry, even in wet or low-temperature conditions. The project **"Technical Textiles as Sustainable Building Materials for Various Structural and Geotechnical Applications in Construction"** explores 2D and 3D textiles like PBO, glass fibers, and geo-grids for reinforcement. Used with or without pre-stressing, they reduce reinforcement demand while enhancing ductility, load capacity, and damage tolerance. Their crack-bridging ability improves structural resilience, while their secondary confining properties help control volumetric expansion and degradation due to rebar corrosion. In geotechnical applications, these textiles reinforce basement retaining walls, preventing water penetration and corrosion. Their uniform mesh distributes stress evenly, improving resistance to lateral soil pressure and increasing structural longevity. Textile waste mixed with geopolymeric binders creates a lightweight, low-cost composite material with high mechanical strength. This composite serves as an alternative to concrete and wood, reducing environmental pollution and promoting sustainable construction. By integrating technical textiles, buildings can achieve higher durability, reduced material consumption, and improved resilience against external forces.