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Chemically Modified Nanocellulose for Cementitious Materials

Chemically modified nanocellulose significantly increases the strength and resilience of cement while reducing the carbon footprint of construction materials.

Researchers at Purdue University have developed a chemically modified (CM) version of the renewable and abundant nanocellulose by altering the material to improve its ability to increase the strength and resilience of cement. Researchers found that through increasing the heat of hydration, the CM nanocellulose reacted to improve the behavior of the cement paste in a variety of chemical reactions, which resulted in a greater potential to alter micro-cracking of cement and bolster the mechanical properties for better performance. This technology offers increased strength and resiliency in the construction of roads, bridges, and buildings. It also supports the widespread effort to divert from traditional, unsustainable engineering practices and instead opt for materials with a minimal carbon footprint. The CM nanocellulose offers a naturally sourced solution to make cement more eco-friendly and reduces the volume and demand of raw materials.

Technology Validation: Mechanical tests showed an increased flexural strength of approximately 30% with 0.2% volume of cellulose nanocrystals integrated into the cement. This result is hypothesized to be from an increase of degree of hydration (DOH) in the cement paste when cellulose nanocrystals were used, which was validated through isothermal calorimetry (IC) and thermogravimetric analysis (TGA).

Advantages:

-Increased strength and resiliency of materials

-Improved mechanical performance

-Reduces carbon footprint of cement

Applications:

Technology ID
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Category
Buildings, Infrastructure, & Construction/Structural Health Monitoring
GreenTech/Carbon Management
Materials Science & Nanotechnology/Nanomaterials & Nanostructures

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Intellectual Property:

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