

Development of Highly Repellent Silica Nanoparticles Treatment for Protection of Bio-Based Insulation Composite Material

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Abstract : The construction sector is on the critical path to decarbonise the European economy by 2050. In order to achieve this objective it must enable reducing its CO₂ emission by 90% and its energy consumption by as much as 50%. For this reason, a new class of low environmental impact construction materials named “eco-material” are becoming increasingly important in the struggle against climate change. A European funded collaborative project ISOBIO coordinated by TWI is aimed at taking a radical approach to the use of bio-based aggregates to create novel construction materials that are usable in high volume in using traditional methods, as well as developing markets such as exterior insulation of existing house stocks. The approach taken for this project is to use finely chopped material protected from bio-degradation through the use of functionalized silica nanoparticles. TWI is exploring the development of novel inorganic-organic hybrid nano-materials, to be applied as a surface treatment onto bio-based aggregates. These nanoparticles are synthesized by sol-gel processing and then functionalised with silanes to impart multifunctionality e.g. hydrophobicity, fire resistance and chemical bonding between the silica nanoparticles and the bio-based aggregates. This talk will illustrate the approach taken by TWI to design the functionalized silica nanoparticles by using a material-by-design approach. The formulation and synthesise process will be presented together with the challenges addressed by those hybrid nano-materials. The results obtained with regards to the water repellence and fire resistance will be displayed together with preliminary public results of the ISOBIO project. (This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 641927).

Keywords : bio-sourced material, composite material, durable insulation panel, water repellent material

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