Hospital-acquired infections (HAIs) are a key issue with the emergence of antibiotic resistant pathogens. A reported 4-10% of patients will become infected during a stay in hospital; this figure rises to 30% if they are housed in an intensive care unit. One of the main modes of transmission of these pathogenic microorganisms is via contaminated surfaces and textiles. This has been recognised for many years but preventing it is not trivial. The use of antimicrobial textiles as apparel is an emerging frontier in epidemiologically important surfaces in healthcare. Most commercially available coatings are based on silver and are widely perceived as being costly and have focused on consumer-wear (socks, sportswear, t-shirts, etc). Silver based treatments can show high toxicity and there are concerns over the leaching of silver ions into the environment.

The AcTin project is a joint UK-Mexican project aimed at developing a low cost, high efficiency and durable copper and silica nanoparticles based anti-microbial treatment for textiles. The project is developing novel inks to apply these materials onto textiles to optimise antimicrobial efficacy and long-term functional performance to meet the needs of the healthcare market. The key challenge is to tether the copper nano-particles to the textile in a manner that allows antibacterial functionality but prevents leaching of copper into the environment. The AcTin consortium believes that functionalised nanoscale silica nanoparticles can be used as coupling agents to bind the copper to substrates such as textiles.

This presentation will illustrate the approach taken by TWI to design the functionalised silica nanoparticles by using a material-by-design methodology. The formulation and synthesis process will be presented together with the challenges addressed by those novel inorganic-organic hybrid nano-materials.

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**Keywords:** Hybrid Nano-material, Anti-microbial, Silica nanoparticles

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