

RELIANCE Project: Smart response self-disinfected biobased nanocoated surfaces for healthier environments

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RELIANCE project aims to design and develop smart response self-disinfectant antimicrobial nanocoatings based on a new range of smart antimicrobial nanoparticles. They will consist of mesoporous silica nanoparticles with metallic copper in their structure, modified with biobased bioactive compounds: Antimicrobial peptides (AMP's) based on protein containing waste streams, and essential oils (EOs) coming from non-edible plants. The antibacterial action of these additives will be adjusted to the specific application, according to the dosages and durability requirements. In this way, two alternatives to incorporate the bioactive compounds will be considered:

- The incorporation of the biobased EO into the porous substrate, to allow a controlled release (T or pH) of the bioactive compounds to the environment,
- The attachment of the AMP to the nanoparticles surface, to allow a long-term action of the bioactive compound to the environment. RELIANCE project combines contact killing and leachable antibacterial actions ascribed to the additive with the non-sticking action due to the coatings' formulation, thus providing an integral holistic solution to antimicrobial problems on different surfaces.

The nature of the coatings, their characteristics (hydrophobicity and surface roughness) and their application methods (direct deposition by cold-atmospheric plasma, high throughput spraying or selective digital printing) are being specifically designed to allow not only the microbial repelling action, but also the adhesion of the coatings to different substrates commonly found in our living environments, such as metals, plastics or textiles, and to maximize their durability (in terms of performance and antibacterial properties).

Moreover, to monitor the effectiveness of eco-friendly antimicrobial coatings paper-based sensors were developed for the electrochemical detection of essential oils (specifically thymol, eugenol, and carvacrol) and a sandwich-type immunosensor for detecting the SARS-CoV-2 virus using a paper-based origami design.

The project runs from June 2022 to May 2026. It involves 15 partners from 8 EU and 2 non-EU countries, and is coordinated by Fundacion Tekniker, Spain.

More information about the project can be found at: <http://reliance-he.eu>