SelfClean

SELFCLEAN is a project within the EU Seventh Research Frame Programme (FP7) in the area of Research for the benefit of SMEs. The long term objective of this two-year project is to develop self cleaning-antibacterial coatings of high aesthetics and durability, thus meet the important need of public hygiene in common touched surfaces as knobs and handles.

These composite coatings will consist of Sn-Ni matrix with doped TiO_2 nanoparticles as a reinforcing mean. Doped-TiO_2 nanoparticles having the ability to absorb visible light can be activated indoors and thus present enhanced photo catalytic activity. The incorporation of these doped-TiO_2 nanoparticles in the Sn-Ni matrix will have as a result the self-cleaning and antibacterial properties.

The consortium consisting of 9 partners from 5 different countries will develop new self-cleaning-antibacterial coatings by electroplating technology.

Background

Hygiene/antimicrobial issues in public places eg. hospitals, schools, hotels, public transportation etc. are of crucial importance as inattention could lead to spread of viral diseases or epidemics and consequently to deaths. A typical example is that of hospital acquired infections (HAI). According to The European Centre for Disease Prevention and Control (ECDC) in the EU, about 3,000,000 are infected annually with HAI and about 25,000 patients die from this. Such infections also bring extra healthcare costs and annual productivity losses of at least €1.5 billion. It is estimated that 15% of these infections is due to transmission through inanimate objects. Although sanitization and disinfection of surfaces using chemical liquids as chlorine or alcohol is a common practice to prevent transmission of diseases, many times such procedures are skipped, skimped or in the case of public transportation not practically feasible.

There exists a great need for anti-bacterial/viral surfaces to reduce the spread of diseases. The SMEs of the consortium having identified this need propose the solution of self-cleaning, antibacterial electrolytic coatings of high aesthetics and durability. These composite coatings will consist of Sn-Ni matrix with doped TiO_2 nanoparticles as a reinforcing mean. Doped-TiO_2 nanoparticles having the ability to absorb visible light can be activated indoors and thus present enhanced photocatalytic activity. The incorporation of these doped-TiO_2 nanoparticles in the Sn-Ni matrix will have as a result the self-cleaning and antibacterial properties. Of crucial importance is the percentage of the incorporated nanoparticles. In order to increase the co-deposition rate and consequently the photocatalytic activity, pulse current plating will be utilized. With this method higher co-deposition rate of nanoparticles can be achieved compared to the conventional direct current plating. These kind of coating will be able to operate under indoor light irradiation and can be applied to common touched objects (knobs, taps, handles) reducing the risk of infection's transmission by 50-100%.

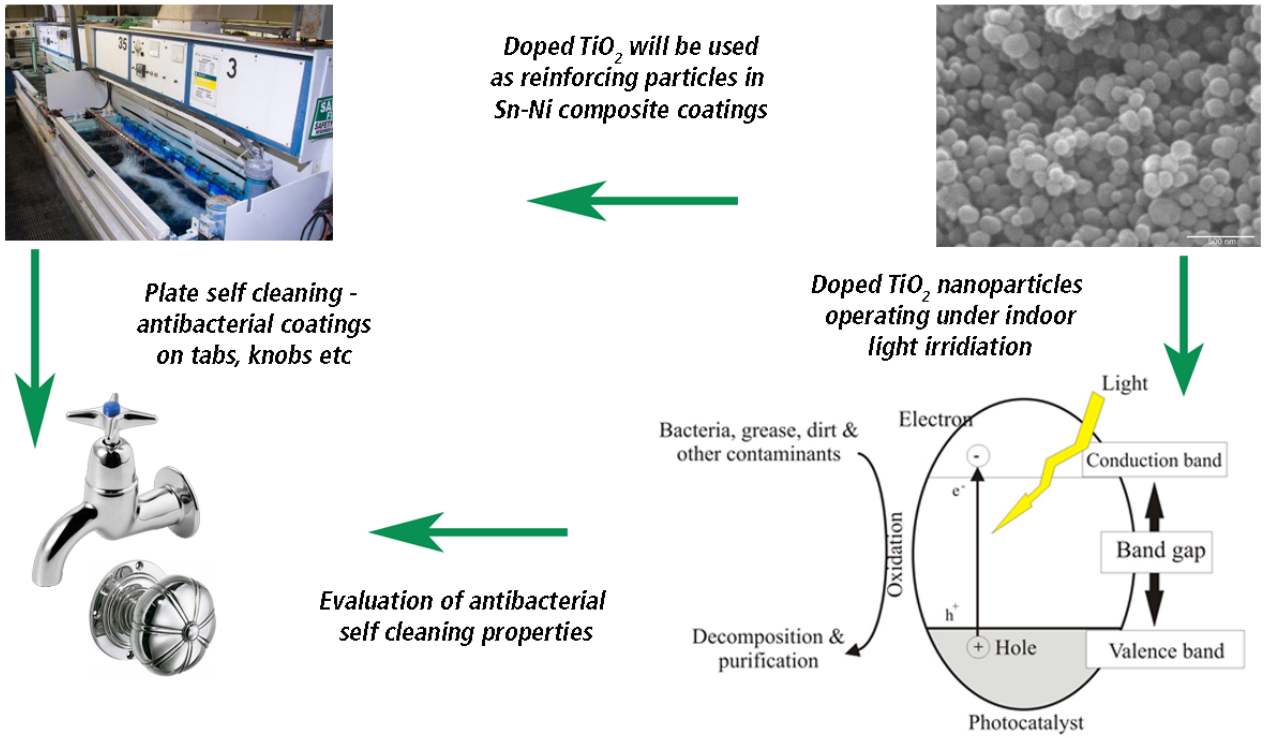
The picture illustrates the difference in colour of the doped powders in comparison to a pure white sample of TiO_2. The white sample to the left sample is P25 Evonic, The light yellow sample in the middle is the (N, S) doped DNT1th powder, and the brownish sample to the right is the (N, Ag) doped DNT1_Ag.).

Objectives

The main objectives of the SelfClean Project for the first 9 months are to:

- Produce a specification report considering the requirements of the end user.
- Select the suitable element for doping TiO_2 nanoparticles.
- Deliver samples of TiO_2 doped nanoparticles with a band gap of < 2.3 eV.
- Select the 2 best performing doped-TiO2 powders regarding photocatalytic and antibacterial properties that resulted from the lab scaled study and synthesize larger quantities.
- Develop a method for the mass production of doped-TiO_2 nanoparticles.
- Characterize the doped-TiO_2 nanoparticles using physical and chemical methods.
- Create a website with interesting info for the public as well.
- Produce the Interim plan for the use, dissemination and exploitation of the knowledge.
- Report on Patent search.

Schematic drawing of the SelfClean project



Project Partners

National Technical University of Athens (Coordinator), Greece

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Kampakas Metallourgiki Techniki Emporiki Kai Viomichaniki, Greece

SP Technical Research Institute of Sweden, Sweden

Jönköping University, Sweden

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