Nanosilver functionalized surfaces

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Developed Materials

Silver based nanosols

Ag^0

$ZrO_2@Ag^0$/core shell

Increasing coating transparency

$TiO_2@Ag^0$/ mixture

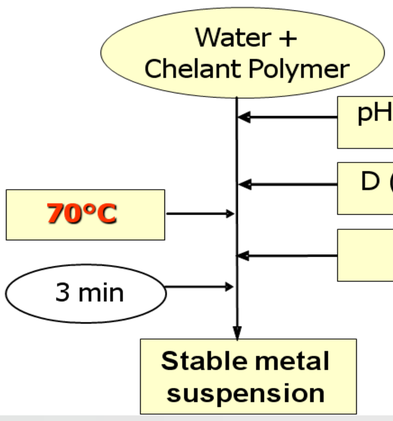
Coniugate TiO_2 photocatalysis with Ag bactericidal effect

Key role of nanosols

Improvement of the industrial scale-up allowing the use of continuous flow systems
Guarantee of the safety in work environments

Nano silver synthesis

The synthesis exploits as reductants: the "reducing sugars"



Patented synthesis
M. Blosi, S. Albonetti, M. Dondi, G. Baldi, A. Barzanti, PCT/EP2010/052534

Green chemistry

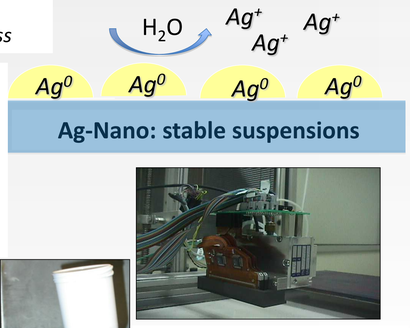
Low-waste method avoiding hazardous reagents, crucial to commercialization and future development

Application on ceramic and glass surfaces

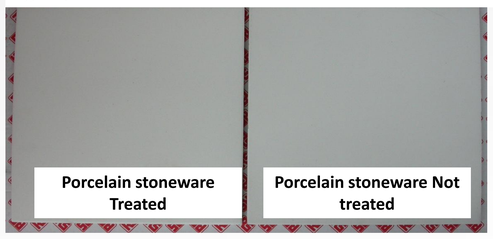
Nano-Ag: *Applied on ceramic or glass surfaces as antibacterial agent, before heating consolidation process*

Nano particles large surface area = better contact with microorganisms.

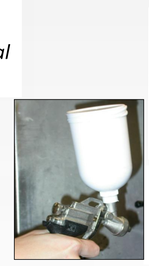
Nanoparticles attached cell membrane, penetrate inside the bacteria, release silver ions that attack the respiratory chain and leading to cell death (bactericidal effect).



Ag-Nano: stable suspensions



Unchanged esthetic characteristics of ceramic surfaces



Application versatility: ink-jet printing, rotocolor, spray gun

Potential application

Interest in nano silver large production due to its high versatility: lots of applications

Ceramic ink for ink-jet printing tech.

Antibacterial additive

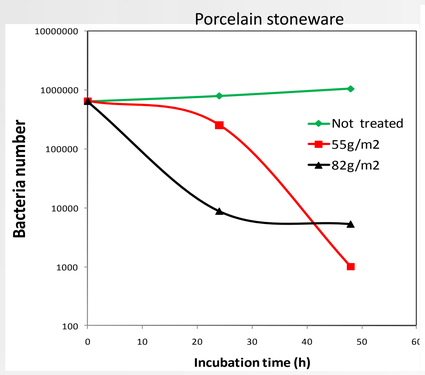
Catalyst in reduction and oxidation

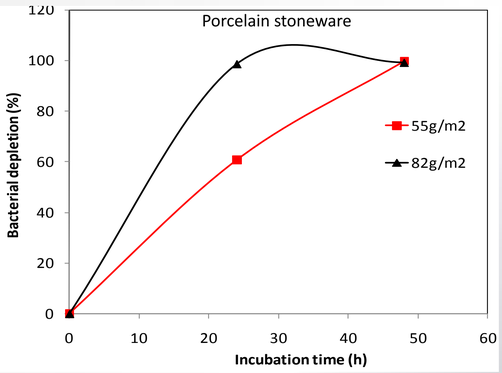
Thermal nanofluids

Improving luminescence for optical and theragnostic applications (bioimaging, cancer therapy)

Nano Ag application on ceramic tiles

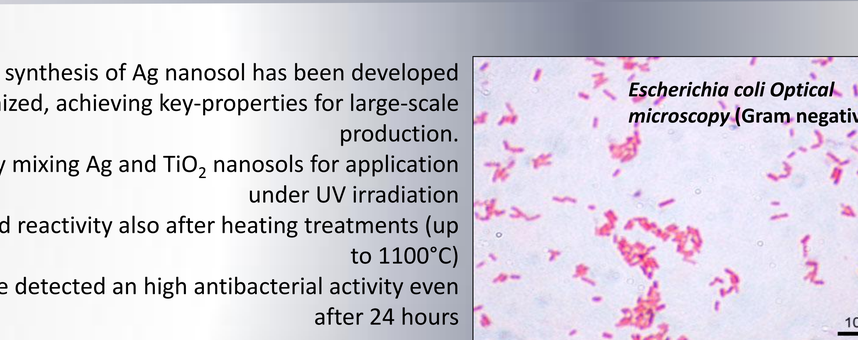
Nano Ag was tested over Escherichia Coli (gram negative bacteria) following the method described in ISO 27447; 2009





High antibacterial activity even after 24 hours.

Nanosols as anti-bacterial agent



Microbiological test results. The first six samples refer to treated ceramic tiles and the last one to a treated glass.

Conclusions

- A green synthesis of Ag nanosol has been developed and optimized, achieving key-properties for large-scale production.
- The bactericidal properties of Ag were improved by mixing Ag and TiO_2 nanosols for application under UV irradiation
- The suspension were applied to ceramic and glass surfaces and preserved the nano-scale structure and reactivity also after heating treatments (up to 1100°C)
- The coated surfaces were tested over Escherichia Coli (gram negative bacteria) and in all cases were detected an high antibacterial activity even after 24 hours