

# A Nordic Project on Enhanced Functionality of Self-Cleaning and Antibacterial Surface Coatings (FUNCOAT)

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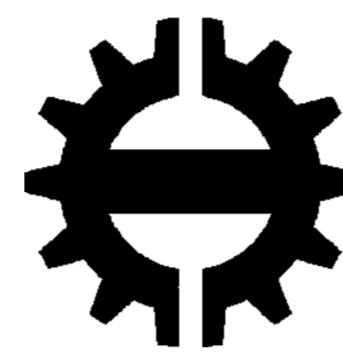
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## AIM

In a Nordic joint research project FUNCOAT (2006-2007), the goal is to develop an industrial coating process for glass and glazed surfaces.

## LFS/nHalo

Here, float glass and glazed ceramic substrates have been coated with TiO<sub>2</sub>-Ag nanoparticles using an industrial process LFS/nHALO (Liquid Flame Spray/Hot Aerosol Layering Operation) (Figure 1).

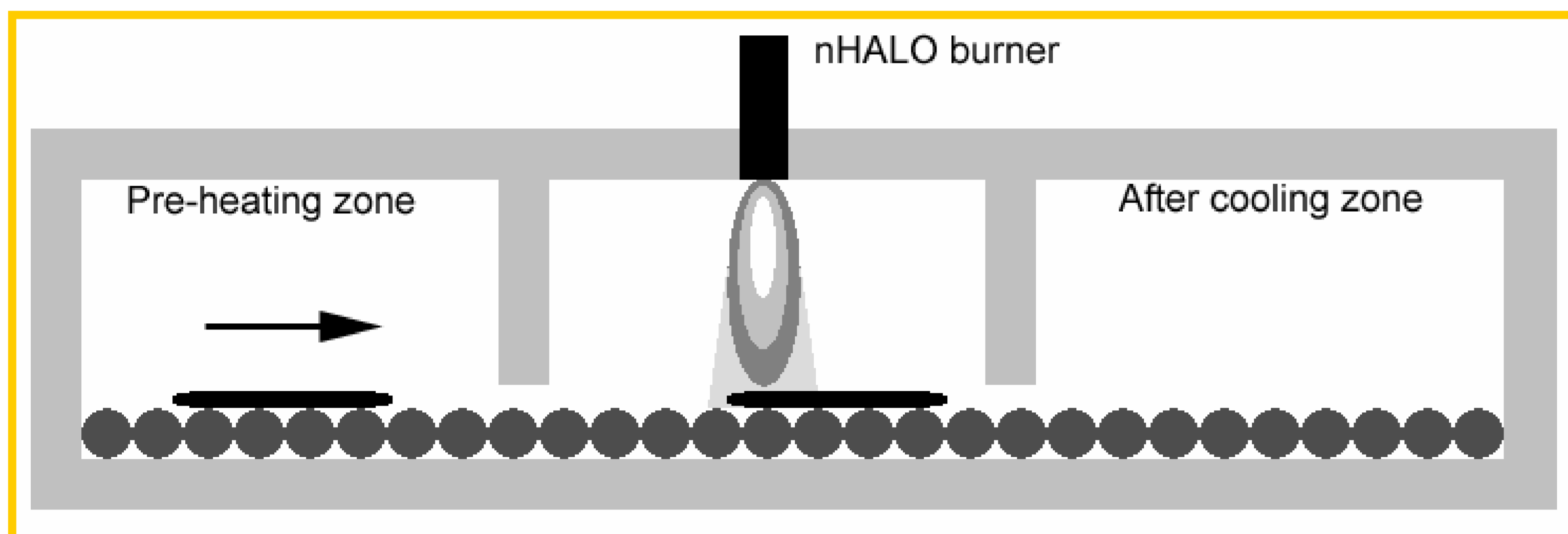


Figure 1. Experimental coating setup. (Beneq Oy)

## EXPERIMENTAL

PRE-HEATING TEMPERATURES: 500, 550 and 600 °C

FLAME: 30 l/min H<sub>2</sub>; 15 l/min O<sub>2</sub>; 5 l/min N<sub>2</sub>

PRECURSORS: Titanium-isopropoxide (TTIP) and silver nitrate (AgNO<sub>3</sub>) in isopropanol solution

SUBSTRATE MATERIAL: glossy and matt ceramic tiles and float glass

LIQUID FEED RATE: 5 and 10 ml/min

PARTICLE PRODUCTION RATE: 50- 200 mg/min

SILVER ADDITION: 0.5- 2 -wt%

COLLECTING DISTANCE: 13 and 17 cm from the flame torch

LINE SPEED: 3 m/min

MORPHOLOGY ANALYSIS: SEM and TEM

PHOTOCATALYTIC ACTIVITY: Methylene blue degradation

## RESULTS

Coatings consisted of composite TiO<sub>2</sub>-Ag particles (Figure 2 and 3). Results from contact angle measurement and methylene blue degradation tests indicate that at the particle production rate 100 mg/min, lower liquid feed rate 5 ml/min deposition distance 170 mm, pre-heating temperature 600 °C, and the silver addition amount 1-wt%, the all tiles were most active.

## REFERENCES

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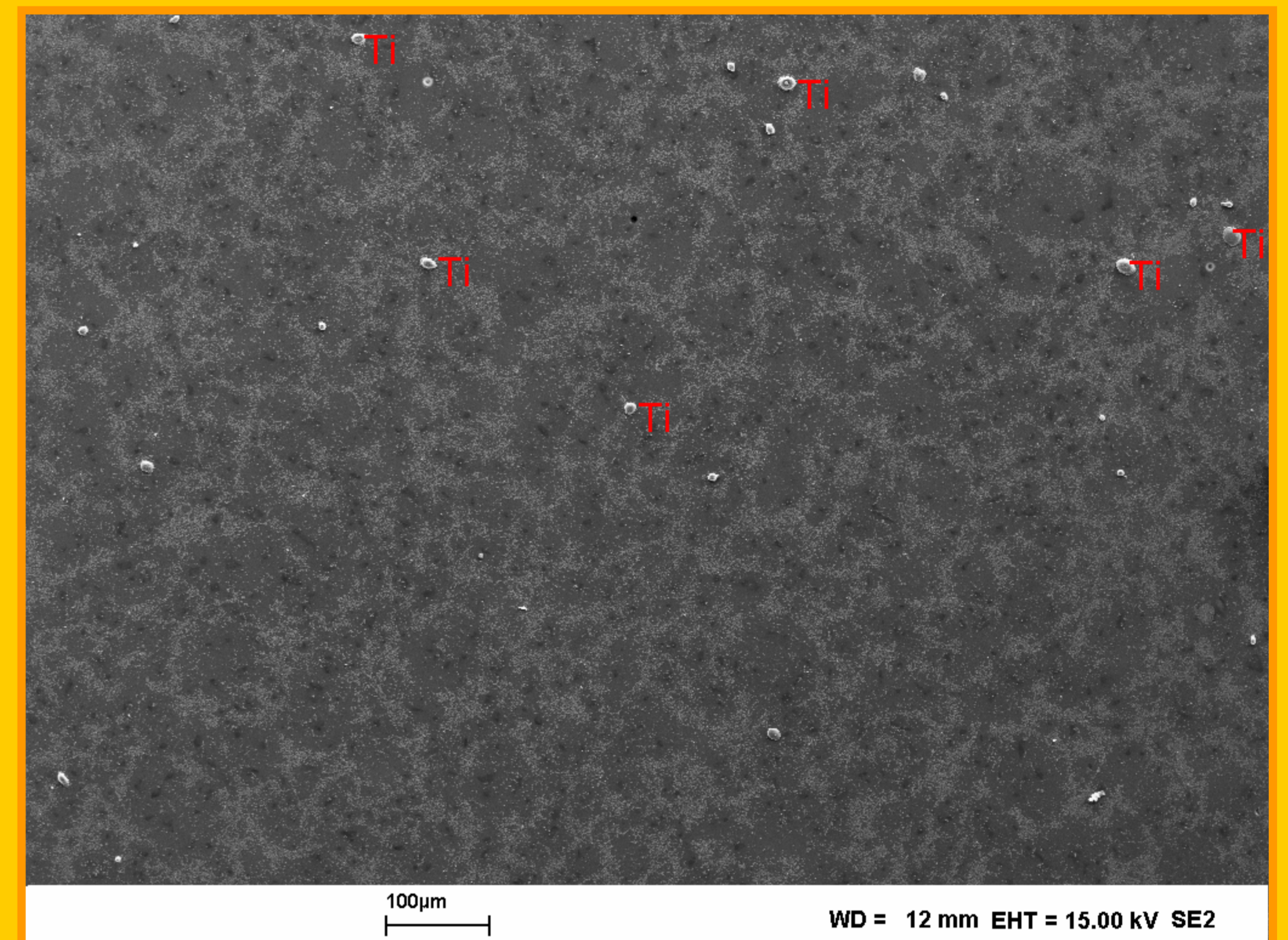


Figure 2. SEM-photo from ceramic tile after coating.

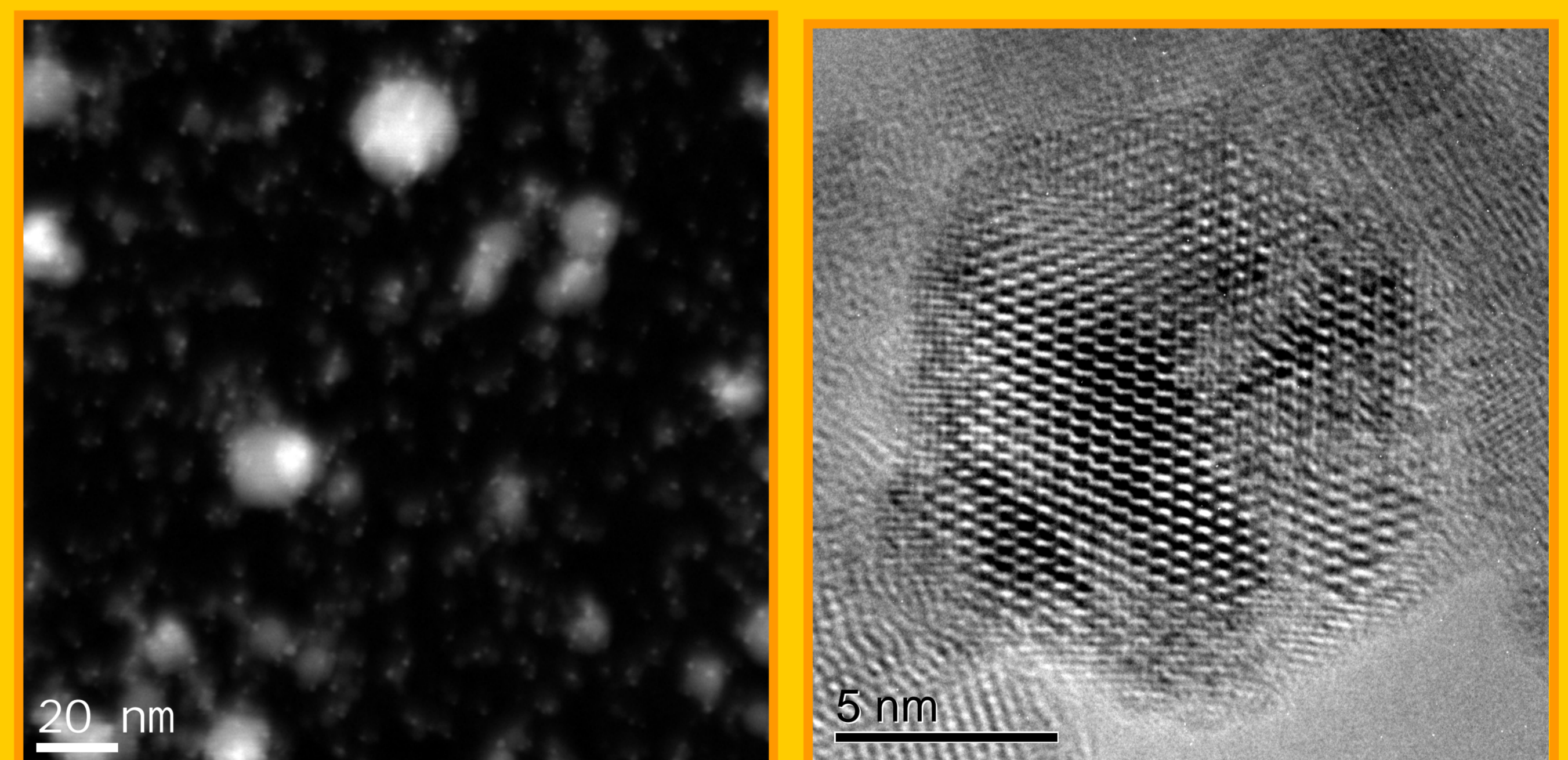


Figure 3. Left: High Angle Annular Dark Field TEM-photo from composite particles; the small bright spots are the Ag particles.

Right: Bright field HR-TEM picture from TiO<sub>2</sub> anatase [100] crystal.

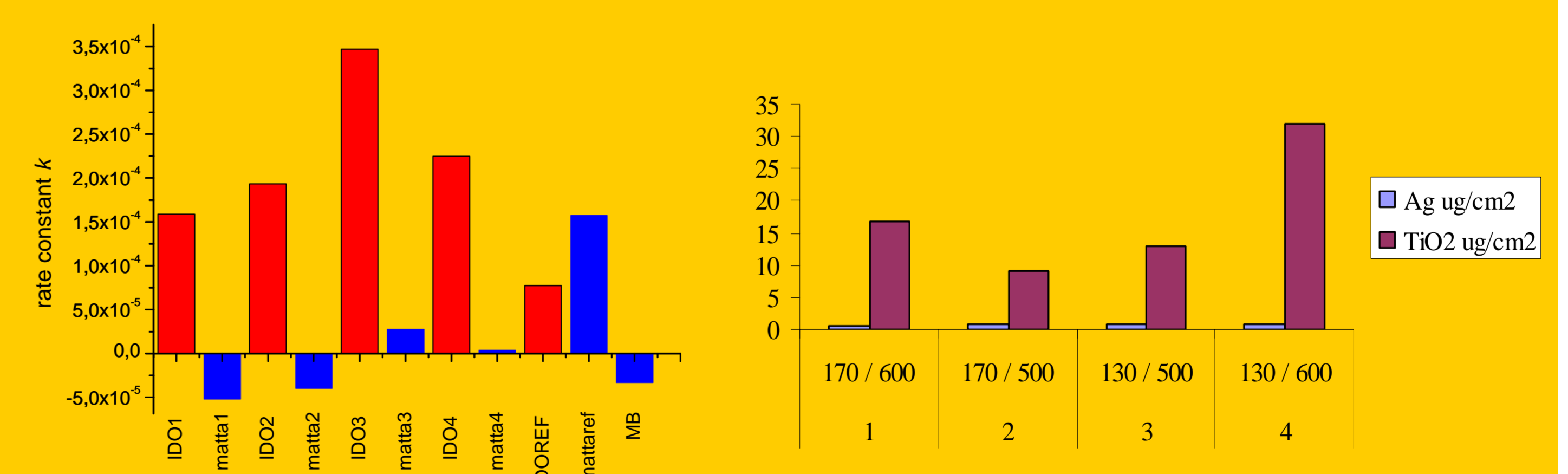


Figure 4. Left: Methylene blue degradation rate constants for different substrates.

Right: Leaching from coated float glass by HF acid mixture + Digestion to dissolve TiO<sub>2</sub>

