Eco-Friendly coatings against multi-resistant bacteria

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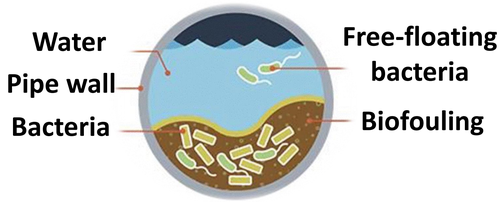
MOTIVATION

Biofouling on industrial surfaces

Contaminated waterborne systems

Pipe cross-section



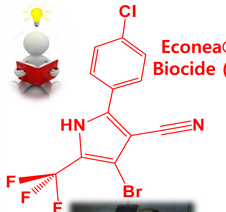
CHALLENGE

- **Alternative non-toxic antifouling strategy** against most conventional ones, which release toxic agents.
- **Long-lasting & more efficient** antifouling effects.
- **Accomplish EU legislations** (BPD Nº528/2012).

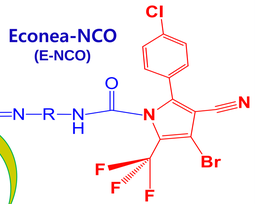
ECO-FRIENDLY HOW!

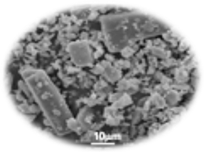
The innovative approach:

Funcionalized biocides with grafting ability to coatings

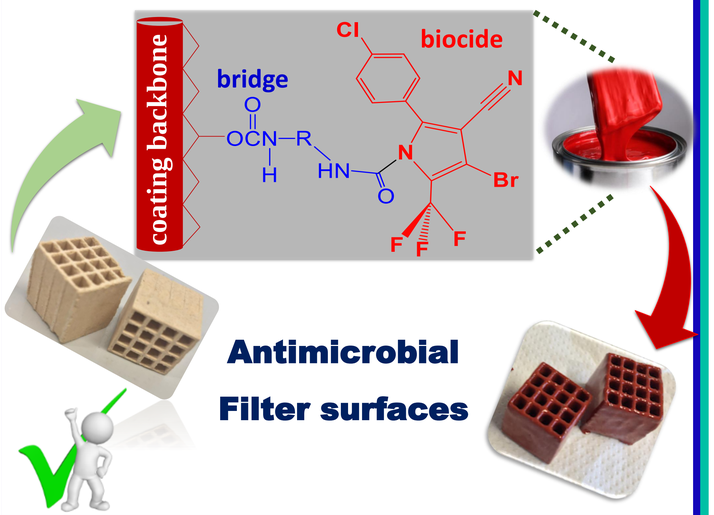


O=C=N-R-N=C=O
40-50 ^{0}C, 300 rpm
Di-isocyanate



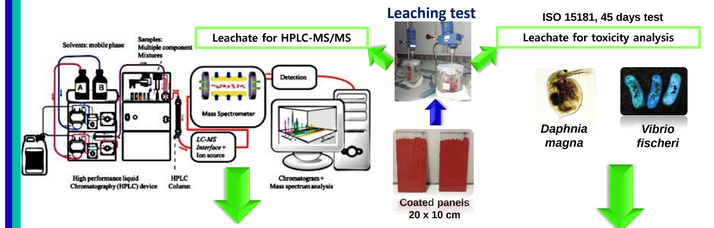


Grafted Econea biocide in coating components



PROOF-OF-CONCEPT

Leaching & ecotoxicity of biocidal coatings

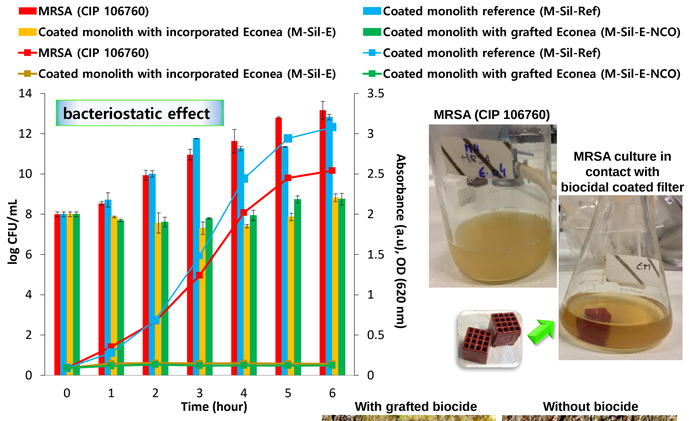


The release of biocide is 10 times less for the coating with grafted biocide (Sil-E-NCO) than a conventional releasing coating (Sil-E)

Non-Toxic coatings EL50 > 50 Vol.%

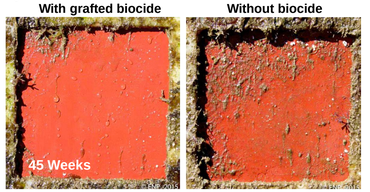
Antifouling activity of silicone coatings with grafted biocide

Active against multiresistant *Staphylococcus aureus* bacteria (MRSA)!



Field tests at open Atlantic seawater after 45 days submersion.

Significant improvements were observed.



Main achievements

- ✓ Econea biocide was successfully grafted in coatings matrix.
- ✓ Biocide leaching from coatings reduced by a factor of 10 against a conventional biocide-releasing coating system.
- ✓ Coatings with auspicious antimicrobial effects, allied with bacteriostatic behavior against multi-resistant bacteria (MRSA).
- ✓ Coatings with auspicious antifouling effects at real conditions.

To know more consult:

(1) Ferreira, O. et al. Biofouling inhibition with grafted Econea biocide: toward a nonreleasing eco-friendly multiresistant antifouling coating. *ACS Sustainable Chem. Eng.* 2020, 8 (1), 12-17.

(2) Silva, E. R. et. al. Eco-friendly non-biocide-release coatings for marine biofouling prevention. *Sci. Total Environ.* 2019, 650 (2), 2499−2511.

(3) Silva, E.R. et al. Functionalization process for biocide immobilization in polymer matrices. Granted patent PT108096B, 2019.

Acknowledgements

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