# Self-healing corrosion protective coating

## The ability of keeping protecting even after damaged

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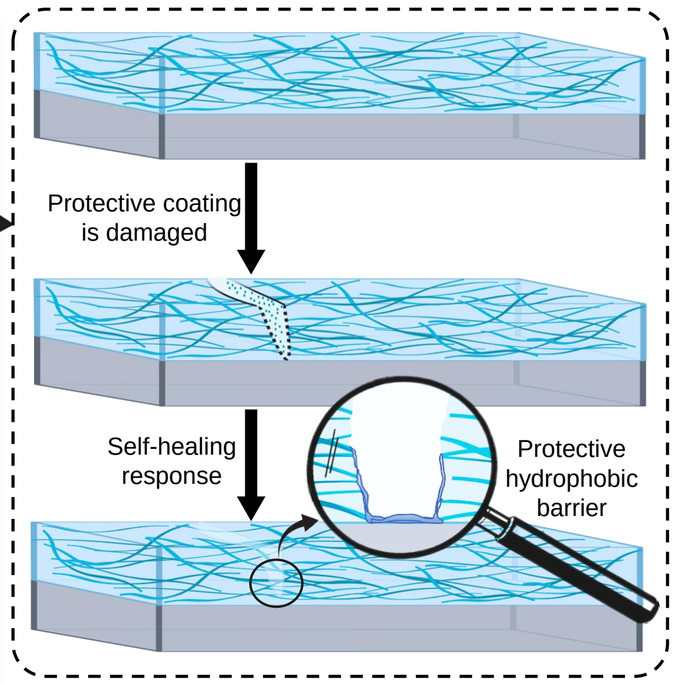
## Corrosion protective coatings

### Problematic

- Offshores structures: operates in a highly corrosive environment
- Abrasion and erosion demands high maintenance costs
- Protective coatings are applied to ensure the metallic structures resistance
- Damages at the transportation and handling hasten the corrosion process even before their final installation




*Self-healing corrosion protective coating response.*

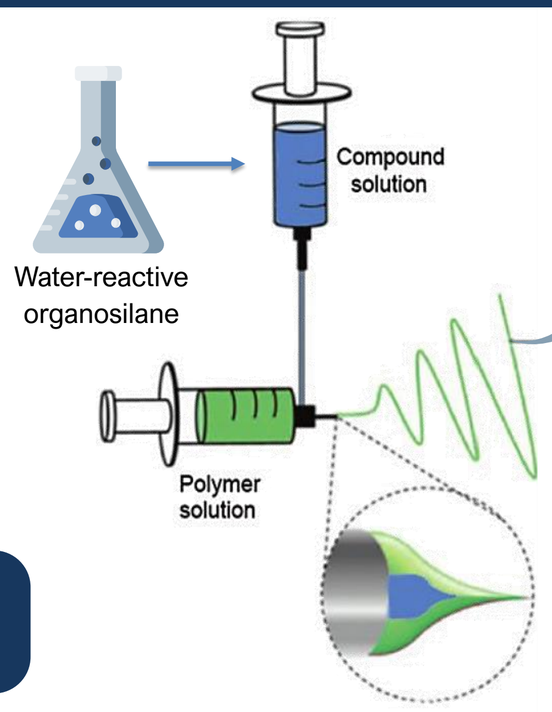
### Solution

- Use of a smart corrosive protection coating
- Self-healing technology:
  - Nanofibers randomly dispersed in the coating matrix
  - Triggered by a mechanical damage
  - Autonomously responsive in high humidity environment
- Protection ensured even after damages

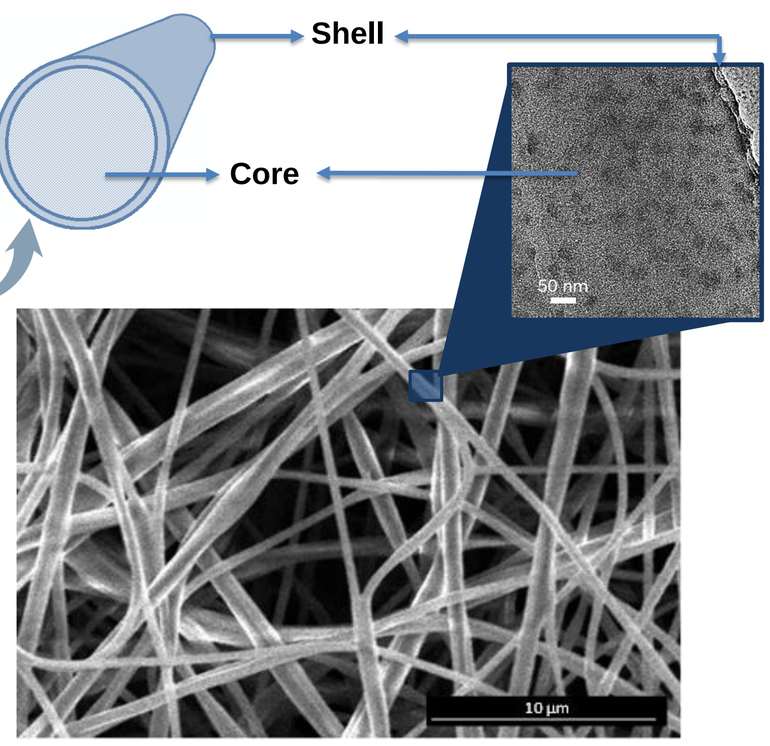
## Self-healing coatings

### The technology

- Synthesis of an water-reactive organosilane
- Incorporation of the compound in a spinnable solution
- Co-axial electrospinning of core-shell nanofibers
- Dispersion and application of the self-healing material a coating formulation
- Artificial damage: protective shell is disrupted and the core material is exposed
- Exposure to humidity and water
- Crosslinked hydrophobic barrier → The protective layer is self-healed!!

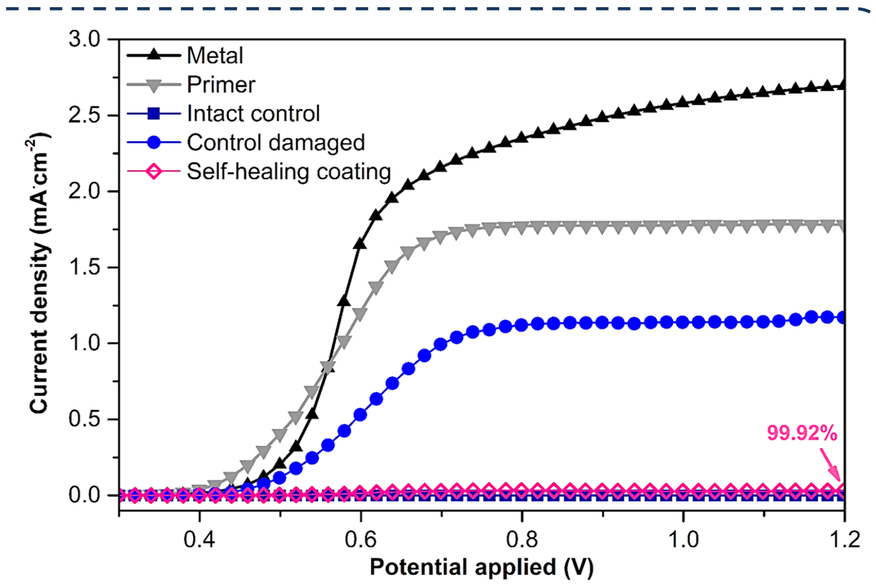



*Coaxial electrospinning scheme.*



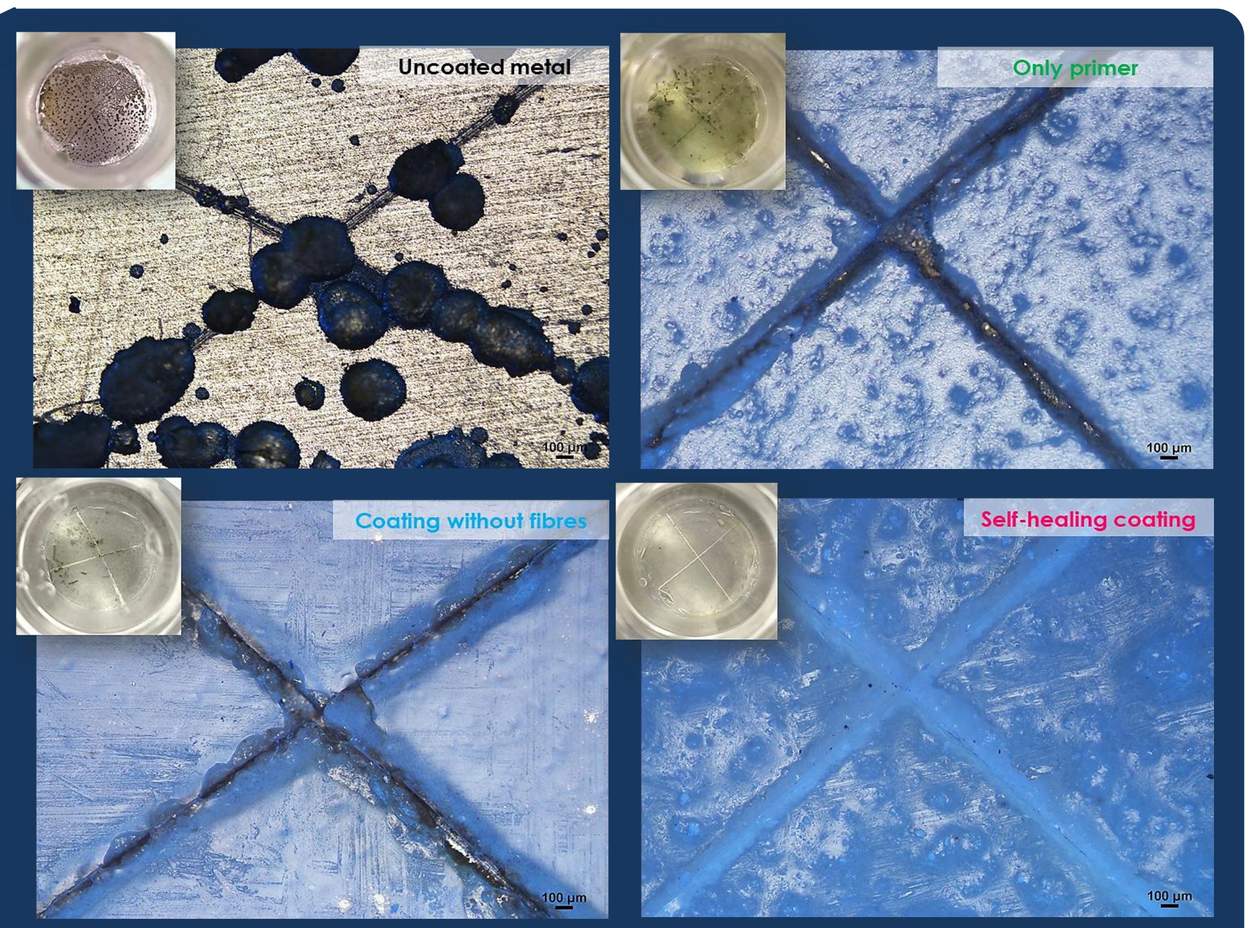

*Core-shell nanofibers with diameter ≈ 500 nm.*

### Corrosion tests




*Electrochemical Impedance Spectroscopy (EIS) results in sea water.*

### Protective Behaviour




*Macro and microscopic images after the EIS test.*

### Conclusions

- Effective extrinsic self-healing via nanofibers as corrosion barrier activated by water contact
- Application of the self-healing coating via spray painting (easy to scale-up)
- 99.92 % of protection against corrosion after a damage event (up to 97.5% healing response)

## References

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S. An, M.W. Lee, A.L. Yarin, S.S. Yoon, A review on corrosion-protective extrinsic self-healing: Comparison of microcapsule-based systems and those based on core-shell vascular networks, Chem. Eng. J. 344 (2018) 206–220.

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