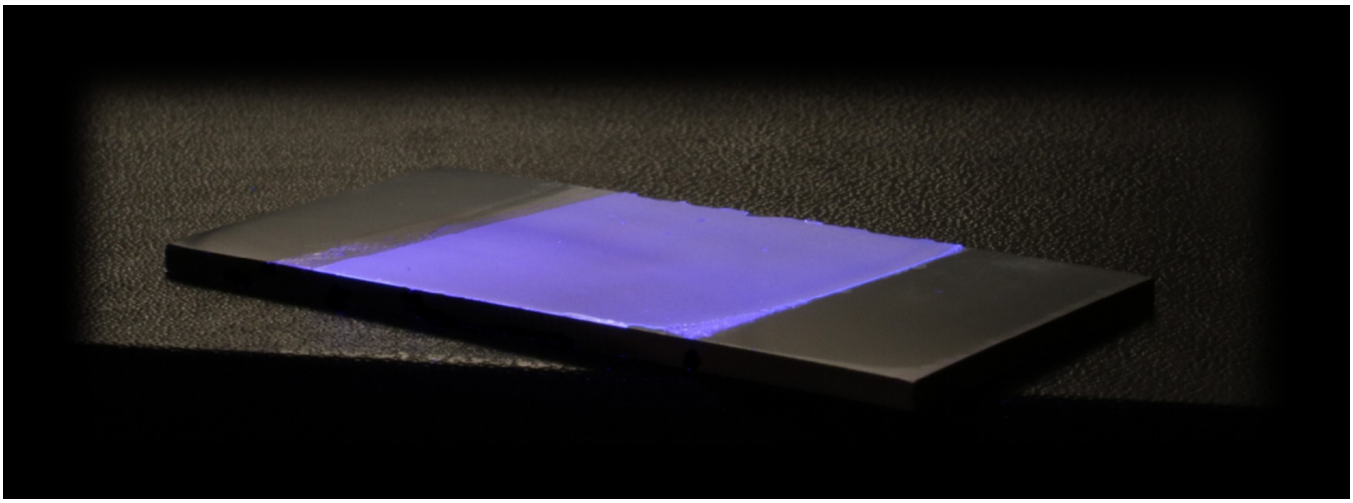
ETH zürich

# Licensing Opportunity

## Recyclable anticorrosion coating for metals with self-healing properties



*PPM copolymer coatings render metals and alloys corrosion resistant and exhibit excellent barrier properties. Cracks self-heal intrinsically.*

### Application

Poly(phenylenemethylene) (PPM) copolymer coatings protect metals and metal alloys from corrosion. Intrinsic self-healing mitigates or totally quenches localized corrosion including pitting. The coatings are applied as thin as 5 - 50 micrometers and comply with coating adhesion ISO 17463:2014.

### Features & Benefits

- tailored glass transition temperature and rheologic properties
- standard thermoplastic processing
- intrinsic self-healing & UV-triggered fluorescence
- compatibility with common polymer additives (i.e. pigments)

### Publications

- Int. J. Mol. Sci. 2022, 23, 16103, "Improving the Corrosion Protection of Poly(phenylene methylene) Coatings by Side Chain Engineering: The Case of Methoxy-Substituted Copolymers, https://doi.org/10.3390/ijms232416103
- Patent pending


transfer

**ETH transfer**
transfer@sl.ethz.ch
www.ethz.ch/transfer
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Invented by
ETH Zürich: W. Caseri, M. D'Elia, M. Niederberger
Università degli Studi di Milano: M. Magni, S. Trasatti


### Technology Readiness Level

1 2 3 4 **5** 6 7 8 9

### Background

Corrosion prevention widely relies on the use of organic, cross-linked polymers. These compounds are, however, hazardous for environment and health. Also, the end-of-life scenario of these coatings often involves landfill or incineration prohibiting the achievement of a circular economy. PPM has unique properties as an anticorrosion coating and has been proposed as alternative to crosslinked coatings. The thermoplastic processing of PPM homopolymer is, however, difficult and the resulting coating brittle.

### Invention

The above mentioned disadvantages are overcome by the use of engineered PPM copolymers. A set of PPM copolymers were obtained via side chain engineering. The physical properties and the processability of the material can be tailored. The coatings are applied by standard thermoplastic processing methods (dip coating, injection molding, etc.) or formulated in paints and applied via spray coating. The PPM copolymers and formulations can be stored and transported as powders and easily disperse in suspension. The corrosion protection ability of the PPM copolymer has been characterized by electrochemical impedance spectroscopy over many aging cycles. The tests show that the PPM copolymer is more easily processed at low thicknesses than currently available PPM blends, saving polymer material and cost. UV-exited visible fluorescence of the PPM copolymer facilitates the visual detection of cracks in the coating. At the end of life, the PPM copolymer coatings can be separated from the metallic substrate with solvents to recycle both the coating and the metal.