



A Tannin-based Inhibitive Pigment for a Sustainable Anti-corrosive Epoxy Coating Formulation

Lamprakou, Zoi; Bi, Huichao; Weinell, Claus Erik; Dam-Johansen, Kim

Publication date:
2021

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):

Lamprakou, Z., Bi, H., Weinell, C. E., & Dam-Johansen, K. (2021). *A Tannin-based Inhibitive Pigment for a Sustainable Anti-corrosive Epoxy Coating Formulation*. Abstract from EUROCORR 2021, Budapest, Hungary.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

A Tannin-based Inhibitive Pigment for a Sustainable Anti-corrosive Epoxy Coating Formulation

Zoi Lamprakou, Huichao Bi*, Claus Erik Weinell, Kim Dam-Johansen

CoaST, Department of Chemical and Biochemical Engineering, Technical University of Denmark (DTU), 2800 Kgs Lyngby, Denmark

*Corresponding author. E-mail: hubi@kt.dtu.dk

During the past years, tannins have been extensively used as corrosion inhibitors in boiler feed-water and water cooling systems to protect the internal parts of the equipment. Their inhibition action relies on the physical or chemical adsorption (depending on the environment) to the metal surface and the formation of a protective film. Tannins are considered one of the most abundant components extracted from natural resources, after cellulose, hemicelluloses, and lignin due to their high concentration in several plants.

The use of organic inhibitive pigments that can be extracted from natural resources has driven researchers' attention recently. The substitution of the commercially available inorganic inhibitive pigments (e.g. zinc phosphate) by organic can provide with non-toxic, renewable, low cost and efficient raw materials the pigments industry [1], [2]. Tannin-based pigments are promising candidates in this direction. Tannate complexes have been synthesized from tannins and added to organic coatings. However, the research on the performance of tannate inhibitive pigments in organic coatings is still quite limited [3], [4].

The present work investigates the anti-corrosive performance of the calcium tannate complex into an epoxy coating system in comparison to the commercially available inhibitive pigments. Calcium tannate was synthesized, characterized and dispersed into the epoxy coating. Electrochemical Impedance Spectroscopy (EIS) and Scanning Acoustic Microscopy (SAM) were employed to monitor the anti-corrosive performance of the coating formulated with the as-prepared pigment after the exposure to the salt spray chamber. Reference coatings with the commercial zinc phosphate and calcium phosphate pigments were also evaluated for comparison reasons. The effective anti-corrosive properties of calcium tannate were successfully demonstrated by both EIS and SAM results.

- [1] J. Sinko, "Challenges of chromate inhibitor pigments replacement in organic coatings," *Prog. Org. Coatings*, vol. 42, no. 3–4, pp. 267–282, 2001.
- [2] M. Pia, V. Figà, A. Privitera, M. Bruno, A. Napolitano, and S. Piacente, "Inhibition of Cor-Ten steel corrosion by 'green' extracts of *Brassica campestris*," *Corros. Sci.*, vol. 136, no. February, pp. 91–105, 2018.
- [3] A. V. Zmozinski, R. S. Peres, K. Freiberger, C. A. Ferreira, S. M. M. Tamborim, and D. S. Azambuja, "Zinc tannate and magnesium tannate as anticorrosion pigments in epoxy paint formulations," *Prog. Org. Coatings*, vol. 121, no. April, pp. 23–29, 2018.
- [4] A. Hadzich, S. Flores, J. Caprari, and R. Romagnoli, "Study of zinc tannates prepared with Tara powder (*Caesalpinia spinosa*) as anticorrosive pigments in alkyd paints and wash primer formulations," *Prog. Org. Coatings*, vol. 117, no. December 2017, pp. 35–46, 2018.