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Press release **Public Defence on 13 May 2022**

Lignin as a coating in corrosion protection

Title of the doctoral thesis	Performance of Lignin as a Sustainable Anticorrosion Coating
Content of the doctoral thesis	The application of paints as organic coatings is a common method for protection of metallic surfaces against corrosion. The production of paints, however, is currently mainly based on the utilization of non-renewable resources that not only contribute to depletion of petroleum resources, but also results to environmental pollution during and after their service life. Consequently, more environmentally benign sources are needed to replace synthetic polymers that are used in barrier coatings. As such, this doctoral research aimed to evaluate the performance of (technical) lignin, an abundant and cheap biopolymeric material, as a raw material for preparation of anticorrosion coatings on steel surfaces. The examination of various deposition schemes from different coating media (solvent-based/water-based) and their subsequent effect on the electrochemical response of the lignin-coated surfaces constituted the core of this dissertation, which aimed to fill the knowledge gap on the performance of lignin coatings in corrosion protection applications. The key findings in this dissertation were as follow: (1) The presence of a solvent-based lignin coating on stainless steel (SS316L) surface decreased the corrosion rate of the substrate in a mild electrolyte (phosphate buffered saline), although other obtained results suggested that solvent-based coatings did not provide long-term protection (24 h) for an iron-phosphated steel in a harsher electrolyte (5 % NaCl). (2) Two industrially applicable organic solvents were revealed as being suitable solvents for two different types of technical lignin. (3) The increased solid concentration in solvent-based coatings enhanced their susceptibility to crack formation but this was mitigable with addition of a plasticizer (triethyl citrate). (4) Diethylene glycol monobutyl ether (DEGBE) was demonstrated as a solvent in preparation of colloidal lignin particles (CLPs) and was revealed to provide a coalescing characteristic during CLPs drying. Such characteristic enabled CLPs to act as a film forming binder in a cellulose-lignin coating and together provided an enhanced long-term (15 days) stability during immersion in 3.5 % NaCl, although further research is needed for preparation of commercially applicable anticorrosion coatings.
Field of the doctoral thesis	Processing of Materials
Doctoral candidate and contact information	M.Sc. (Tech.) Arman Dastpak arman.dastpak@aalto.fi
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Place of public defence	Aalto University School of Chemical Engineering, Circular Raw Materials Hub, lecture hall Aluminium, Vuorimiehentie 2, Espoo
Opponent(s)	Professor Iris De Graeve, Vrije Universiteit Brussel, Belgium
Custos	Professor Mari Lundström, Aalto University School of Chemical Engineering
Link to electronic thesis	https://aaltodoc.aalto.fi/handle/123456789/51
Keywords	Lignin; Organic coating; Steel; Corrosion protection

Dissertation will be on public display at https://aaltodoc.aalto.fi/doc_public/eonly/riiputus/