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Exploring supervised machine learning algorithms for predicting pitting corrosion damage of AA1050 exposed to ethanol-containing fuels

Aluminum alloys are crucial in car manufacturing, but the rise of bioethanol fuels has raised concerns about alcoholate corrosion. Gazenbiller et al. have already explored temperature-induced alcoholate pitting corrosion in AA1050 aluminum exposed to anhydrous ethanol.1 To extend this study, a specially constructed reactor is used, which allows for in situ tracking of chemical corrosion damage by providing video and image documentation of the AA1050 corrosion exposed to different ethanol-gasoline blends. We leverage this data to estimate corrosion damage by utilizing artificial neural networks, ensemble methods (random forest, XGBoost) and support vector machines. These models serve as black-box estimators within specific usage limits and using both weight loss and the corroded surface area from images as corrosion damage quantification.

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Keywords

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