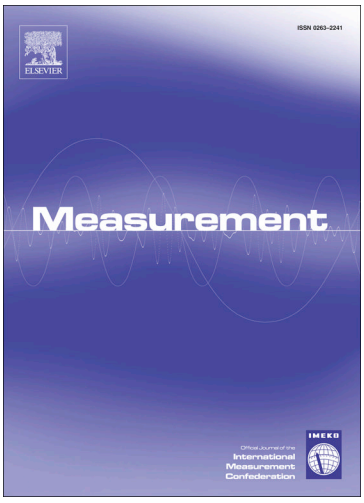


# Optimizing the electrolyte chemistry parameters of PEO coating on 6061 Al alloy by corrosion rate measurement: Response surface methodology

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# Optimizing the electrolyte chemistry parameters of PEO coating on 6061 Al alloy by corrosion rate measurement: Response surface methodology

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**Abstract**

Different chemistry parameters of electrolyte, including KOH, $Na_2SiO_3$ and $Al_2O_3$ nano-particles concentrations were used to obtain the best coatings by plasma electrolyte oxidation (PEO). This work presents the formulation of a mathematical model based on chemistry parameters of electrolyte to predict the responses of corrosion behavior of PEO-coated 6061 Al alloy. In order to reach this goal, three compounds including KOH, $Na_2SiO_3$ and $Al_2O_3$ nano-particles in different concentration ranges were used and a response surface methodology was employed to develop the regression models. Analysis of variance was the method to determine the electrolyte chemistry that affects the responses. Approval trials were carried out to confirm these results. The results indicated that the lowest corrosion current density can be obtained at low concentrations (1-2 g/L) of KOH, high concentrations (5-6 g/L) of $Na_2SiO_3$, and moderate concentrations (2-4 g/L) of $Al_2O_3$ under the current conditions and process time employed in this particular study. Also, the study of microstructure and morphology of different coatings confirmed this electrolyte condition model. This condition led to an electrolyte with the best conductivity and oxidizing state, and highest contribution of electrolyte components in the coating growth process.

**Keywords:** Al alloy; PEO; corrosion; nano-particles; response surface methodology.