Green processes of etching and anodizing of magnesium alloys for aeronautical applications

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Magnesium alloys have advantageous properties such as low density, high specific strength, and good castability. Hence they are more and more used in new applications in different industrial fields such as automotive and aeronautic. Unfortunately magnesium alloys are highly susceptible to corrosion, which is a serious limitation for their forthcoming uses. Therefore, surface treatments are required to improve protection against corrosion. Historically, there are two types of anodizing of the magnesium alloys: Dow 17 process and HAE process. But firstly these treatments are toxic for humans and the environment, because they include hydrofluoric acid and hexavalent chromium. Secondly they are quite difficult to establish and control, in order to obtain reproducible and efficient protective coatings against corrosion.

In the present study, nitric acid etching was extensively studied, influence of various operating parameters being clarified through a kinetic and thermodynamic study. Our study allowed predicting the etching rate and to clarify the different reactions occurring during pickling. Then an innovative anodizing process, performed in acidic and environment-friendly medium, is studied.

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