LETTER

Comments on the paper "Influence of the heat treatment in the electrochemical corrosion of Al–Zn–Mg alloys" by P. L. Cabot *et al.*

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In a recent paper by Cabot *et al.* [1] the change in the corrosion properties of aluminium alloys due to heat treatment was investigated by well-known electrochemical [e.g. 2, 3] and microscopic methods.

The corrosion resistance of the passive layer formed on the alloys was characterized by the critical pitting potential, E_π [3]. However, the electrochemical interpretation of pitting corrosion using Tafel slopes, R_p values, or even the equilibrium potential of the $Al_2O_3.3H_2O/Al$ couple is misleading. R_p value and Tafel slope can only be determined in the case of corrosion controlled by electron transfer processes. In the case of the highly localized corrosion of passive metals discussed in this paper, even the formal application of R_p measurement and the Tafel extrapolation technique are not possible due to the continuous change in the pitted surface area.

In the case of aluminium the formation and degradation of the passive layer are determined mainly by kinetic factors [e.g. 4, 5]. Therefore, E_{corr} or E_π values cannot be related to calculated thermodynamic data as the equilibrium potential of the $Al_2O_3.3H_2O/Al$ couple.

Sulphate ion shifts the E_π values of aluminium in the positive direction [3]. Contrary to the statement of Cabot *et al.*, the results of radiotracer experiments [5] proved that this effect is not due to the specific adsorption of sulphate ion. In fact this ion eliminates the migration transport of chloride just as a supporting electrolyte does. Therefore, adequate and reproducible E_π values can be measured only in the presence of a large excess of sulphate.

References

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