Data Evaluation of the Protection Performance of Maize Husk Particulate Reinforcements on 1170 Aluminium Alloy Corrosion in Dilute Electrolytes

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Abstract:

Maize husk (MH) particulates at wt.% composition of 5% and 10%, and particle sizes of 150 and 300 um were added to the microstructure of 1170 aluminium alloy (Al) and analysed for their effect on the corrosion resistance of the maize husk reinforced aluminium composites Al/MH in 3.5% NaCl, 0.00625 M H_2SO_4 and 3.5% NaCl/0.00625 M H_2SO_4 solution by weight loss method. Protection performance results obtained at 264 h of exposure shows the MH particulates significantly enhanced the corrosion resistance of the Al/MH at 5 wt.% comp./150 um particle size (45%) and 5% wt./300 um particle size (30%) in 3.5% NaCl solution at 264 h. In 0.00625% H_2SO_4 solution, MH particulates significantly weakened the corrosion resistance of the Al/MH composites at all MH wt.% comp./particle sizes. Protection performance data at 264 h varied from-58.77% to 8.77 % which are significantly below the threshold 20% protection performance values. However, in 3.5% NaCl/0.00625% H_2SO_4, protection performance data above 20% threshold was obtained for Al/MH composites at 10% wt. comp./300 um particle size, 5% wt. comp./150 um particle size and 10% wt. comp./300 um particle sizes (22.58%, 38.71% and 29.03%). Results from ANOVA statistical method shows MH particulate wt.% comp./particle size is the important determinant factors influencing the protection performance results of Al/MH composites compared to exposure time with statistical relevance factor values of 36.53%, 77.98% and 18% from the electrolytes. The proportion of data above 20% protection performance for CB and CS particulates in 3.5% NaCl solution is 0% at margins of error of 0%. The corresponding values in 0.05 M H_2SO_4 solution are 15.18% and 15.32%

at margins of error of 40% and 43% while the values from 3.5% NaCl/0.05 M H_2SO_4 solution are 14.78% and 15.5% at margins of error of 35% and 50%. The proportion of data above 20% protection performance for Al/MH composite in 3.5% NaCl solution is 30% at margins of error of 14.2%. The corresponding values in 0.00625 M H_2SO_4 solution are 15% at margins of error of 15.42% while the values from 3.5% NaCl/0.00625 M H_2SO_4 solution are 63% at margins of error of 15%.

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