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Deposition, characterisation and evaluation of plasma polymerized Allyl Methacrylate coatings as primer on aluminium

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Allyl Methacrylate (AMA) was deposited on aluminium using an atmospheric barrier discharge plasma setup. AMA possesses two C=C bonds which have very different reactivities and the efficiency of the atmospheric plasma on polymerising the two double bonds is evaluated.

Fourier-transform Infrared Spectroscopy (FT-IR) and X-Ray Photoelectron Spectroscopy (XPS) provide information about the chemical composition and the physical properties of the coatings. ¹³C HR-NMR spectrum was used complementarily to verify the FTIR findings. It appears that the most reactive vinyl bond is fully converted during the plasma polymerisation and the less reactive allyl bond polymerises in a high degree although there is still some pendant allyl group, indicating a likely more cross-linked network than in conventionally polymerised AMA.

Further investigation with Differential Scanning Calorimetry (DSC) reveals exothermic reactions that start near 90 °C. Thermogravimetric Analysis (TGA) was used to study the degradation of the film. The barrier properties of the coatings were determined by Electrochemical Impedance Spectroscopy (EIS). This plasma deposition procedure is found to be promising deposition technique as it combines a good coating quality, low cost, high deposition rates and good adherence performance.

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Keywords

allyl methacrylate

organic primer

dielectric barrier discharge