Towards the anticorrosion protection of aluminum surfaces by using an atmospheric pressure microwave plasma

A. M. Raya, F.J. Morales-Calero, A. Cobos-Luque, R. Rincón, J. Muñoz(*), M.D. Calzada

Laboratorio de Innovación en Plasmas, Edificio Einstein (C2), Campus de Rabanales, Universidad de Córdoba, 14071, Córdoba, Spain

Aluminium plays an important role towards the sustainable use of metals, as it can be fully recovered without losing any of its properties, thus guaranteeing the development of sustainable technologies on the long term. However, it experiments a fast corrosion of its surface under the exposure to harsh environments, which affects its performance. Among other techniques, the deposition of graphene as a protector against corrosion in aluminum surface is suggested to avoid this drawback [1]. In this research, argon atmospheric pressure surface wave discharges (2.45 GHz) working at 200 W were studied, using ethanol and nitrogen as plasma precursors for this purpose. On the one hand, multilayer graphene and multiwall carbon nanotubes [2] were obtained from ethanol decomposition (Fig. 1). On the other hand, aluminum surfaces were treated by the afterglow formed at the end of the Ar/N_2, which resulted in the cleaning and activation of Al surface; producing a significant increase of its hydrophilicity (Fig. 2) by favouring the appearance of hydrophilic radicals (OH) [3]. Therefore, further research is being focused on developing a single-step process for the deposition of anticorrosive graphene-based layers on metal surfaces by atmospheric-pressure plasma technology.

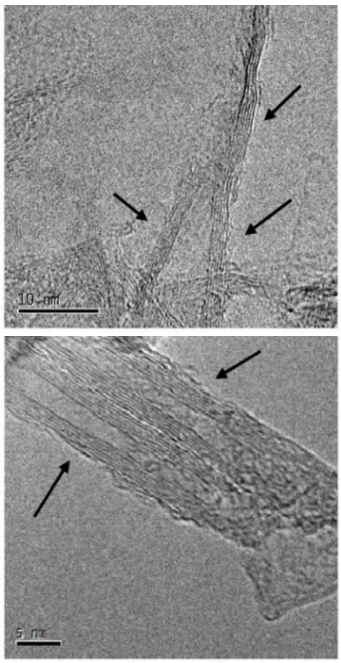

Fig. 1. High-Resolution Transmission Electron Microscopy images of multilayer graphene sheets (top) and multiwall carbon nanotubes (bottom) [2].

Fig. 2. Images of water drops on untreated (top) and plasma treated (bottom) aluminum surfaces [3].

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References

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