Enhanced Gas Barrier Property of Graphene oxide/Ethylenediamine Composite Film by Ethylenediamine Vapor Treatment

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Gas resistant graphene oxide/ethylenediamine (GO/EDA) film was formed by controlling the amount of ethylenediamine vapor. This was possible by exposing EDA vapor in different time to aqueous graphene oxide liquid crystal (GOLC) coating. The amount of EDA and the exposure time affect EDA intercalation between GO nanosheets. A GO/EDA coated on polyethylene terephthalate (PET) film was good at resisting five different gas molecules, which were He, H_2, CO_2, N_2, and CH_4. In comparison to the neat PET film, the gas permeance was reduced up to 99.6% (He) and 98.5% (H_2). The high tortuosity of aligned GO scaffolds gives the excellent gas barrier properties to GO/EDA composite film. In addition, crosslinking EDA and oxygen-containing groups of GO improves the mechanical properties and stability of the GO/EDA film. Thus, the viscoelastic properties of GOLC and the volatility of EDA are important at coating to both two-dimensional and three-dimensional figures.