OPE14) Multifunctional UV-curable Two Dimensional hBN/polyurethane Acrylate Nanocomposite Coatings

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1. Introduction

Multifunctional nanocomposite coatings with excellent mechanical and thermal properties have been increasingly demanded by many pioneering fields. This study deals with the organic-inorganic hybrid nanocomposite coatings based on the UV-curable polyurethane acrylate as a matrix and hexagonal boron nitride (hBN) as reinforcement were successfully fabricated.

2. Result and Discussion

In this study, modified hBN added into the oligomeric formulation with different amounts, such as 0.1, 0.2, 0.5, 1, and 2 wt% to increase mechanical properties, thermal properties, hardness, and adhesion properties. The main interest has been focused on polymer-based nanocomposites with diverse nanoparticles. Furthermore, the addition of nanoparticles can have beneficial effects on the anticorrosive and mechanical properties of organic coatings, even at low loads because of the inherent small sizes and the particle morphologies. In summary, the incorporation of hBN into PUA exhibited superior tensile strength at the break as compare to PUA, which was probably attributed to more uniform dispersion. For 0.5% of modified hBN in PUA films achieved 35.81% enhancement in tensile stress at the break without sacrificing % elongation. However, the addition of modified hBN had a negative impact on the transmittance of UV-cured PUA coatings. Adhesion of nanocomposite coatings with the pre-coated metal sheets was evaluated from the cross-cut tape test and cross-cut Erichsen cupping test, which confirmed the addition of hBN (up to 2 wt%) in the PUA coatings exhibits superior adhesion properties.

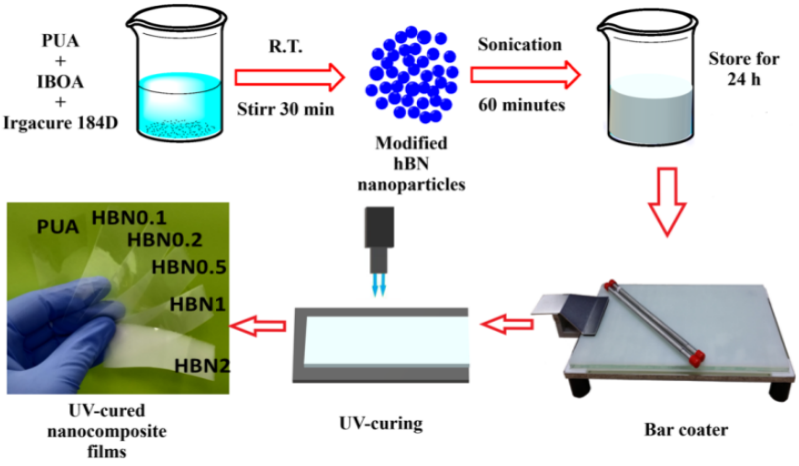

Fig. 1. Schematic presentation of UV-curable modified hBN/PUA nanocomposite film fabrication method.