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UV-LED as a new emerging tool for curable polyurethane acrylate hydrophobic coating
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Abstract
The elimination of mercury, low energy consumption, and low heat make the ultraviolet light-emitting diode (UV-LED) system emerge as a promising alternative to conventional UV-mercury radiation coating. Hence, a series of hydrophobic coatings based on urethane acrylate oligomer and fluorinated monomer via UV-LED photopolymerisation was designed in this paper. The presence of fluorine component at 1160 cm−1, 1235 cm−1, and 1296 cm−1 was confirmed by Fourier Transform Infra-Red spectroscopy. A considerably high degree C=C conversion (96–98%) and gel fraction (95–93%) verified the application of UV-LED as a new technique in radiation coating. It is wellaccepted that fluorinated monomer can change the surface wettability as the water contact angle of the coating evolved from 88.4° to 121.2°, which, in turn, reduced its surface free energy by 70.5%. Hence, the hydrophobicity of the coating was governed by the migration of the fluorine component to the coating surface as validated by scanning electron and atomic force microscopies. However, above 4 phr of fluorinated monomer, the transparency of the cured coating examined by UV-visible spectroscopy experienced approximately a 16% reduction. In summary, the utilisation of UV-LED was a great initiative to develop green aspect in photopolymerisation, particularly in coating technology.

Author Keywords
Fluorinated polyurethane acrylate; Surface properties; UV-LED

Index Keywords
Atomic force microscopy, Contact angle, Energy utilization, Fluorine, Free energy, Hydrophobicity, Light emitting diodes, Mercury (metal), Monomers, Photopolymerization, Ultraviolet visible spectroscopy; Fluorinated monomers, Fourier transform infra reds, Hydrophobic coatings, Low energy consumption, Photo-polymerisation, Polyurethane acrylates, Ultraviolet light-emitting diodes, UV visible spectroscopy; Coatings

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