Deposition of Ultrathin Photocurable Perfluoropolyether Films from Liquid CO_2 High Pressure Free Meniscus Coating and Curing

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Coatings of traditional fluoropolymers are challenging because of poor solubility in conventional organic solvents, low melt flowability, and poor weldability. Recently, thin fluorinated polymer coatings from liquid carbon dioxide (l-CO_2) or supercritical carbon dioxide (scCO_2) have widely investigated because of high solubility of fluoropolymers in the compressed CO_2 medium, unique coating conditions, environmental benignity, and high film qualities. In this study, we demonstrate that ultrathin fluorinated films with optically clear and chemically resistant characteristics are produced by first depositing photocurable perfluoropolyether from l-CO_2 high-pressure free-meniscus coating (hFMC) and subsequent curing of the deposited films. Film thickness ranging 3-13 nm was controlled by adjusting solution concentration ranging 5-15 wt%. Highly robust, solvent-resistant films were produced by UV curing of the deposited films. Contact angles of the coated substrate after solvent washing were in the range of 105 - 115 °C.