

PHOTO-INITIATED SOL-GEL PROCESS FOR ADVANCED FUNCTIONAL THIN-FILMS AND COATINGS

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Organic-Inorganic hybrid (OIH) materials have emerged as important materials of choice for their applications in myriads of advanced systems and products. One of the unique advantages of Sol-gel derived OIH materials is our ability to manipulate their morphology and functionality at micro / nano scales that allows for customization of properties and performance in end-use products. The commonly used aqueous process for OIH material typically involves of first making “sol” by hydrolysis of precursors and applied them onto the substrates where the “gel” reaction results in deposition of thin films. We have recently developed a unique photo-initiated sol-gel process of deposition of functional OIH films up to 25mm thickness, using photo-latent acids and bases as photo-catalysts. This photo-initiated sol-gel process, besides mitigating many of the technical and sustainability challenges of aqueous process, provides an efficient and sustainable alternative. Some insightful approaches and highlights of results of our study on metal pretreatments and 3D printing materials will be presented.