Multimodal Dynamic Imaging of Therapeutic Biomedical Coatings in Aqueous Medium

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Abstract

Drug release from therapeutic biomedical films such as drug-polymer composite coatings on drug eluting stents is a highly complex and poorly understood process. The dynamics of drug release and the evolution of surface morphology during release have direct impact on the performance of the device. This information is not easily accessible, and there have been few systematic studies to investigate drug release from biomedical coatings in real time. In this study, the complementary analytical techniques of confocal Raman microscopy, in-liquid atomic force microscopy, scanning electron microscopy, and high performance liquid chromatography were used to examine real-time mobilization and release of the drug rapamycin from polyisobutylene-block-polystyrene thin films, during immersion in buffered saline for 12 h. Each technique was found to have distinct limitations in either temporal or spatial resolution; in combination, however, the overlapping techniques provided a level of detail that is not available using any single approach.