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Plasma deposition of textiles for obtaining electromagnetic shielding and fire-retardant properties

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The stringent regulations regarding the electromagnetic exposure and fire safety have gained particular importance in the recent years. In this context, the obtaining of smart textiles in accordance to these regulations, by eco-friendly plasma-based techniques, is of tremendous interest. The present contribution reports on the synthesis and characterization of metal-organosilicon composites or layered materials by using hybrid PVD/PECVD techniques. The deposition of metal and silicon-based materials was conducted in a stainless-steel vacuum chamber provided with a magnetron sputtering source and a PECVD plasma source. The sources were mounted perpendicular one to each other, and respectively at 45 degrees in respect to the substrate. The textile substrate of natural or synthetic composition is sequentially exposed to plasma generated by magnetron sputtering of a metallic target (Cu, Ag) and to the plasma generated by PECVD source in an Ar/HMDSO mixture. According to the experimental parameters used for each plasma source, layered or mixed structures of metal-polymer coatings are obtained on the fabrics surface. The topographical and morphological characteristics of the as-synthetized textile materials were investigated by means of Scanning Electron Microscopy (SEM) techniques. The chemical composition of the obtained materials was evaluated through Fourier Transform Infrared Spectroscopy (FTIR) and X-ray Photoelectron Spectroscopy (XPS) investigations. The fire-retardant properties and electromagnetic shielding effectiveness of the smart textiles were investigated utilizing the standard procedures SR EN ISO 6941/2004, and ASTM D4935 standards, respectively.
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smart textiles
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electromagnetic shielding
fire retardant