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Application of inorganic fullerene-like nanoparticles and nanotubes of tungsten disulfide as an advanced nanomaterials in polyurethane water-based coatings for military camouflage protection

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A possibility has been examined of improving mechanical properties of a polymeric water-based coating for military camouflage protection by adding inorganic fullerene-like nanoparticles of tungsten disulfide (IF-WS₂) and inorganic nanotubes of tungsten disulfide (INT-WS₂). These nanostructures were added and dispersed in polyurethane paint by ultrasonic irradiation. The paints were applied to standard steel plates, and dried, for examinations of corrosion resistance to 3.5 % of saline solution and of the following physical-mechanical properties: hardness, flexibility, elasticity, abrasion resistance, resistance to steel balls impact and stickness. These properties were compared for coatings without and with IF-WS₂ and INT-WS₂ nanoparticles. The effect of adding IF-WS₂ on rheological properties of the paint has been examined using Dynamic Mechanical Analysis (DMA), observing viscosity as a function of the shear rate. Furthermore, the camouflage properties were also examined - IR reflection and colorimetry, as well as ATR-FTIR analysis, which confirmed the chemical inertness of WS₂ nanostructures. Significant improvements of mechanical resistance to abrasion and steel balls impact, as well as elasticity, have been achieved. Furthermore, corrosion resistance to 3.5 % of saline solution increased with the concentration of nanoparticles, where the coatings with nanotubes shows much better corrosion resistance compared with the coatings with nanoparticles.

Biography

Dragana Lazic graduated at the Faculty of Technology and Metallurgy, University of Belgrade, where she is currently attending PhD studies at the Department of Chemical Engineering. She works as researcher in the Military Technical Institute, particular in the field of polymeric materials. In addition, she participated in 3 conference and published 4 papers in scientific journals.

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