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Morphology and thermal emissivity study of multilayer PVD metal-oxide/diacrylate polymer onto different plastic substrates/parts for automotive industry

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The automotive sector has made efforts to obtain high-quality chrome-like coatings that might replace metal parts in the vehicle interior. Chromium-free solutions are a demand in the last years due to European requirements regarding the removal of hazardous substances in vehicles production. Currently, alternative solutions without hexavalent chromium can be found. Nevertheless, there're still gaps, particularly related to the industrial manufacturing process but also on the chromium-like brightness effect and metallic cool touch. Plastic interior components, used in automotive industry, do not present the same cool touch as metals at room temperature. Therefore, we expect to develop a multi-thin coating thru Physical Vapour Deposition (PVD) to enhance the thermal and aesthetical properties of chromium-free plastic parts for automotive interior.
In this work, we present a comparative analysis of metal-oxide/diacrylate polymer multilayer (PML) coated onto injected plastic parts for automotive interior, specifically compositions of acrylonitrile butadiene styrene (ABS) with polycarbonate (PC), and polyamide (PA). For characterization, planar set injected structures and injected 3D plastic parts were considered. Morphology and microstructure of the films and surface topology of the metal-oxide and PML films were studied using Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM). Contact angle, energy surface (ES) and Adhesion (ASTM D3359 7) tests were also performed. As an evaluation of the performance of the coating, a thermal emissivity study was performed (ASTM C1371 - 04a) for the different plastic parts.
With these results we expect to deliver innovative sustainable and high-performance chromium-like, and chromium-free, plastic components for the automotive interior.

Keywords
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PVD
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Chromium-Like