

## Deposition of UV-filter oxide films on cork and rubber – protection to UV radiation and from mechanical wear

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**Abstract:** The sun's ultraviolet rays strongly contribute to the aging and discoloration of some outdoor products. In addition, they may suffer severe mechanical wear when subjected to friction. This is especially critical for materials like cork and rubber, natural materials with distinctive specific properties such as high elasticity, high porosity and thermal and acoustic insulation. Both products have a wide range of applications ranging from wine stoppers and gym flooring to footwear and aerospace industries. Solving these issues while keeping their original properties is a challenge of this work. Deposition of metallic oxide thin films with high transmission in the visible region and high absorption in the UV range, but also resistance to mechanical wear, may be the adequate solution to solve the referred problems. TiO<sub>2</sub> and ZnO thin films are potential candidates. Cork and rubber are difficult to coat since they are granulated, have high deformation and roughness, and are temperature sensitive. Despite these challenges, TiO<sub>2</sub> and ZnO thin films were successfully deposited by magnetron sputtering (MS) and atomic layer deposition (ALD) on both products. The deposited TiO<sub>2</sub> thin films show high transmission in the visible range and they block radiation with  $\lambda < 320$  nm, but ZnO thin films reveal better behavior since they can block radiation with  $\lambda < 380$  nm. Sun exposure tests proved the best protecting performance of the ZnO films. Mechanical properties such as tensile tests, scratch tests and hardness were investigated for both coated and uncoated materials as well.