MANUFACTURING TIN FILMS THROUGH A ONE-STEP PROCESSING METHOD: SHAPING AND SINTERING BY EPD

Zoilo Gonzalez, Institute for Ceramic and Glass, CSIC, Madrid
zgonzalez@icv.csic.es
Joaquin Yus, Institute for Ceramic and Glass, CSIC, Madrid
Rafael Moratalla, Institute for Ceramic and Glass, CSIC, Madrid
Antonio Javier Sánchez-Herencia Institute for Ceramic and Glass, CSIC, Madrid
Begoña Ferrari, Institute for Ceramic and Glass, CSIC, Madrid

Key Words: Titanium Nitride, Electrophoretic Deposition, One-step Processing, Shaping, Sintering.

Sintering in ceramics involves thermal treatment of a shaped sample (in green) at a temperature lower than the melting point, leading to consolidated microstructures. During the sintering treatment, several phenomena provide the driving force for these consolidation and densification and phenomena as grain growth, phase transformation and others, take place. Therefore, the final properties of ceramics strongly depend on both the shaping and sintering process. The sintering can be classified depending on the driving force acting on it. Among the common sintering techniques, the electric field assisted sintering has raised interest in last years because it allows for densification to occur at lower temperatures and in shorter times when compared to other sintering techniques.

Electrophoretic Deposition (EPD) is a colloidal processing technique which provides a high control over the resulting microstructures under the application of an electric field. It consists in the electrophoretic movement of charged particles in a stable suspension and their deposition onto a conducting substrate. EPD has been widely implemented in both the academic and the industrial sector due to the simplicity of the apparatus and the short shaping times needed to complete the coating process. Moreover, EPD allows nanostructures tailoring and strengthening the control over the microstructure of coatings. The films thickness and the amount of the deposited mass can be easily tuned and controlled varying the concentration of the suspension, the applied potential or the deposition time.

Though various theories exist in literature for how the electric field affects the sintering process, not one has been universally agreed upon. In this work, we propose the processing of TiN films though EPD, which involves the shaping and sintering by a one-step processing method. The resulting TiN microstructures were microstructurally and electrically characterized to determine its response to the electric field produced during the EPD process.