Deposition mechanism and characterisation of nanocrystalline TiO2 films produced using the ESAVD method

Xianghui Hou[1] and Kwang-Leong Choy[1]

[1]School of Mechanical, Materials, Manufacturing Engineering and Management
The University of Nottingham
University Park
Nottingham NG7 2RD
United Kingdom

Electrostatic Spray Assisted Vapour Deposition (ESAVD) is a variant of the CVD process. It involves the atomisation of the liquid precursor into aerosol which is subsequently directed under electric field towards a heated substrate where it undergoes dissociation and/or heterogeneous chemical reactions to form a dense and adherent film. This process can be performed in open atmosphere for the deposition of oxide films without the use of sophisticated reactor and vacuum system. Moreover, the use of electric field helps to direct the precursor towards the substrate. Thus, it helps to minimise the loss of materials to the surrounding as well avoiding the deposition onto the reactor chamber. This patented and cost- effective technology has been used to produce a wide range of films and coatings with well controlled structure and composition at the molecular or nanometer level depending on the processing conditions. This paper reports the controlled deposition of nanocystalline anatase TiO2 films. The influence of spray mode and deposition temperature on the crystallinity, grain size and surface topography of the films will be presented. The fundamental deposition mechanism of the process will also be discussed.