KN2600

Growth and performance of durable smart optical coating systems obtained by energetic reactive sputter deposition

Ludvik Martinu, Francis Blanchard, Bill Baloukas, Simon Loquai, Jolanta Klemberg-Sapieha

Polytechnique Montreal, Montreal, Canada

lmartinu@polymtl.ca

Optical coating (OC) applications represent a multibillion dollar market worldwide. As the range of applications of OCs continuously broadens and the need for an increased performance and versatility increases, it is becoming important to develop thin film materials with novel nanostructures based on unconventional approaches to supply them with multifunctional properties.
In our present work we investigate the growth of passive and active metal oxide coatings suitable for large area smart windows based on thermochromic and electrochromic materials, as well as on the performance enhancement of glass and plastics. Specifically, we apply low duty cycle pulsed DC magnetron sputtering (LDMS) and High Power Impulse Magnetron Sputtering (HiPIMS) in a reactive atmosphere, as well as ion bombardment during the film growth in order to obtain passive hard transparent AlN and Al_2O_3 coatings, and high-quality thermochromic VO_2 films, and durable electrochromic WO_3 systems.
We demonstrate that an appropriate control of the surface reactions offers attractive opportunities for tailoring switchable transmittance, reflectance and emissivity, as well as the mechanical, tribological and environmental durability for various applications such as advanced glazings for architectural glass, active color shifting security devices, smart radiators for the thermal control in satellites, performance of displays, and others.

Keywords
Electrochromic WO3, thermochromic VO2
glazing, pulsed reactive sputtering, ion bombardment
micro/nanostructure
smart windows, optical security devices, smart radiators, durability