Contribution ID: **107** Type: **Oral Presentation**

Nanostructured tungsten trioxide thin films by aqueous chemical growth for applications in gas sensing and electrochromism

Tuesday, 10 July 2012 14:30 (20 minutes)

Abstract content
   (Max 300 words)

Abstract
Aqueous Chemical Growth (ACG) is a low cost, low temperature and environmentally benign wet-chemistry technique that has been used to synthesize thin films and coatings of multi-functional Semiconductor Metal Oxides (SMO) that find applications in gas sensing, smart windows, batteries, supercapacitors, etc.
We report here the use of the ACG technique to produce on Corning glass and F-doped Tin Oxide-on-glass (FTO) thin films of WO3, a SMO, which finds applications in gas sensing and electrochromic devices.
While the WO3 thin films prepared on Corning glass substrates were evaluated for their gas sensing behaviour with respect to hydrogen, CO, CO2 and CH4 (flammable and poisonous gases common in mining and industrial environments), those that were prepared on FTO where evaluated for their electrochromic behaviour using Cyclic Voltammetry and UV-Vis-NIR spectrophotometry.
Results obtained on gas sensing showed that WO3 thin films on Corning glass are suitable for hydrogen sensing in the 200-350˚C temperature window. Doping these thin films with graphene resulted in reduction of sensing temperatures to 100˚C. Gas sensing of CO and CO2 was also observed to take place for the undoped WO3 thin films at temperatures of 200˚C and above.
For electrochromism, the WO3 thin films on FTO demonstrated fairly fast optical switching rates from blue to colourless, of less than 10 seconds upon H+ intercalation in 0.1 M H2SO4 electrolytic medium. This makes them applicable for use as electrochromic materials in electronic displays, smart windows and other devices were optical switching is needed.

Apply to be
 consider for a student
   award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
   PhD)?

PhD

Main supervisor (name and email)
and his / her institution

Prof M. Maaza, Materials Research Department, iThemba LABS-NRF, Cape Town.

Would you like to
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Yes

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Session Classification: DCMPM2

Track Classification: Track A - Division for Condensed Matter Physics and Materials