

# **Throwing light on phosphor, display and scintillator materials**

Peter A. Tanner

Department of Science and Environmental Studies, Hong Kong Institute of Education, 10 Lo Ping Road,  
Tai Po, New Territories, Hong Kong S.A.R., P.R. China  
peter.a.tanner@gmail.com

## **Abstract**

The current phosphor and display material technology is environmentally unfriendly because of the use of the mercury discharge. Mercury is a neurotoxin and sustained efforts should be employed to reduce its occurrence in air and water since inevitably it passes into the food chain.

Current production of rare earths for burgeoning uses such as in batteries, permanent magnets, lasers, high temperature superconductivity and phosphor materials is dominated by China, with more than 95% of world production. In view of the environmental damage caused by the extraction of rare earths, the forecast demand increase at ~10% per year, and their surging price, it is expedient to find new materials to replace their use in phosphors.

This presentation will firstly give the background of luminescence and reasons why lanthanide ions have been so important. Some newer technologies which are more environmentally friendly in lighting and display materials are then considered: electron discharge from individual nanoscopic electron guns in vacuum and a noble gas discharge. Both techniques require the use of new phosphor materials with stringent efficiency and stability requirements. The development of such phosphors requires an understanding of their behaviour in the vacuum ultraviolet region and this may be accomplished by theoretical developments and experiments with the use of synchrotron radiation. Applications in plasma display panels and field emission displays are described.

White light production is described and the replacement of lanthanide ions in these devices is considered.

Finally, the roles and applications of lanthanide ions in scintillators and in persistent luminescence are reviewed.