Transition metal doped chalcogenide glasses for broadband near-infrared sources

Richard Curry*, Arshad Mairaj, Mark Hughes, Jonathan Aronson, William Brocklesby and Dan Hewak

**Optoelectronics Research Centre, University of Southampton, Southampton, S017 1BJ, United Kingdom*
Telephone: +44 2380 593163, Fax: +44 2380 593149, Email: rjc@orc.soton.ac.uk

Abstract

The use of rare-earth ion dopants to obtain near-infrared (NIR) emission and lasing in glass fibres and waveguides is well known. However, due to the intrinsic nature of the spin-forbidden *4f-4f* transitions the emission is generally only tuneable over a narrow spectral range (~50nm). The development of a broadband NIR source or tuneable laser would have applications in telecommunications, sensing amongst others. The ability to do this in a non-linear material would have additional benefits including the possibility of developing integrated devices. To this end we have investigated the incorporation of various transition metal dopants into Ga:La:S glass system (GLS). We have identified a number of transition metal ions that show potential for developing broadband source and in particular V^{3+} and Cr^{4+}. When V is incorporated into GLS strong room temperature emission is observed peaking at ~1550nm with what appears to be some dependence of the emission upon excitation at wavelength. The room temperature lifetime of the emission shows a non-exponential decay with a 1/e time of 31μs. The incorporation of Cr into GLS during the glass melting results in the formation of Cr^{4+} ions that act as emitting centres. Again there appears to be some dependence on excitation wavelength of the emission which is ~1100nm when exciting at 800nm. The emission is also seen to shift upon cooling of the sample to 77K to longer wavelengths.

Keywords: Near-Infrared, Transition metal, Emission, Chalcogenide.

Principal Author Biography
Dr Richard Curry is a research fellow at the ORC, University of Southampton. He has active research areas in the development of novel infra-red light sources using non-oxide glasses and organometallic complexes. He also carries out research into the energy transfer mechanisms that lead to emission in various emitting systems.