MONASH University

DEPARTMENT OF MATERIALS ENGINEERING

Seminar

ENGINEERING OPTICAL FIBRES

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Tuesday 28th April 2009, 4:00 p.m. – 5:00 p.m.
Science Lecture Theatre S4

Optical fibres are flexible lightguides in the form of hair-thin transparent threads which can carry light along complex paths into inaccessible places. Fibres can be passive or optically active. Passive fibres merely transfer light from one point to another. Active fibres can produce changes in wavelength, intensity, plane of polarization and other properties of the transmitted light. Most optical fibres in current use were developed for telecommunications and data transmission and are based on silica glass. Silica is mechanically strong and forms highly stable glass but has a limited spectral window, being opaque at wavelengths greater than about 2mm. Fibres based on materials such as fluoride or chalcogenide glasses are less robust and less stable but are transparent at wavelengths up to 7mm and 10mm respectively. Transparent polymers are more flexible than glasses but have limited transparency and are less robust. Different types of fibre find applications in medicine, defence, civil engineering, power generation, nuclear technology, astronomy and in sensors of all kinds. Chemical vapour deposition techniques enable complex fibre nanostructures to be made with high purity silicates. Casting and extrusion techniques are used to make fluoride glass fibres. Light confinement within fibres is achieved either by total internal reflection at interfaces between regions of high and low refractive index within the fibres or by reflection by geometric arrays of holes in so-called microstructured fibres. Fibre fabrication methodologies, including fibre-drawing, are discussed with regard to intrinsic and extrinsic material properties, fibre design, intentional and unintentional nanostructures within fibres and the effects on fibre performance. Smart glasses developed for smart purposes have resulted in improving understanding of the fundamental nature of the amorphous state. A mathematical model of devitrification which predicts materials properties will be outlined. The model is applicable to all glasses including metallic glasses.

Visitors are most welcome: Please note the parking arrangements. There is a designated Visitors Car Park (N1) clearly ground-marked by white paint and tickets, at a cost of $3/day, are available from a dispensing machine. ('Blue' permit designated areas are for Monash members only.). It is also possible to park at other designated Visitors Car Parks (E1, S1 and S2) on the Clayton Campus, but tickets are $1.4/hour.

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