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New Glasses for Active Fibre Devices

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Abstract

Through a series of case studies based on current research topics in Southampton, we describe optoelectronic devices whose realization is entirely dependent on new materials. The first is a practical optical fibre amplifier for the second telecommunications window at 1.3 μm. Such a device based on rare-earth-doped fibres simply does not work in a silica host, where all useful emission is dissipated as heat in the glass. The second is a planar waveguide device, the lossless splitter. In this important component for fibre to the home, fibres with lengths of several metres would normally be required. New glasses allow greater concentrations of the active rare-earth dopant to be incorporated, thereby shrinking the size of the device to dimensions of a few centimetres. Thirdly, new glasses and fibres for fibre-based acousto-optic modulators will be described. These devices have the potential to allow direct modulation of the light within the fibre. Through these three case studies, we highlight the potential role of new materials in three key waveguide devices for telecommunications; amplifiers, splitters and modulators. The paper will conclude by reviewing overall efforts in Southampton in new glasses for optoelectronics, identifying key materials, their properties and applications in a global telecommunications network.