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# BRAGG GRATINGS IN GERMANIA-FREE OPTICAL FIBRES

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To date, most research into Bragg fibre gratings has centred on conventional silica-germania optical fibre. Often, fibres co-doped with boron or containing high concentrations of germania are used in order to increase the achievable refractive index modulation. Occasionally however, it is necessary to write gratings in fibre which contains no germania, a prime example being the $Er^{3+}/Yb^{3+}$-doped fibre laser. $Er^{3+}$-doped fibre lasers are attracting much attention as possible telecommunication sources due to their low noise and inherent compatibility with optical fibre and $Er^{3+}$-doped fibre amplifiers. In order to make single frequency $Er^{3+}$-doped fibre lasers however, it is desirable to co-doped the fibre with large quantities (several percent) of $Yb^{3+}$. This greatly increases the absorption of the fibre at $\lambda$=980nm, while giving efficient transfer of energy to the $Er^{3+}$-ions via resonant excitation. In order to obtain such efficient energy transfer, it is necessary to 'engineer' the phonon energy of the glass in order to minimise back transfer of the energy to the unexcited $Yb^{3+}$-ions. It has been found that a core glass consisting of phosphorous and alumina-doped silica with no germania leads to very efficient operation of both lasers and amplifiers. Unfortunately, this fibre exhibits essentially zero photosensitivity, so at first sight it would appear that it would be impossible to write gratings into it. Nevertheless, by employing the technique of hydrogenation, it is possible to write high reflectivity gratings, and this has led to development of the first DFB doped fibre laser. Results will be presented on the properties of both the gratings and the laser.