

An Improved Method Of Manufacturing Planar Optical Waveguides

Abstract

A novel planar waveguide structure has been constructed by sintering substantially pure SiO_2 layers in a He_2/BCl_3 atmosphere. This results in the
5 generation of a liquid phase of substantially lower viscosity than that of the deposited silica by itself. Since viscous sintering is enhanced by the presence of this liquid, consolidation occurs at lower temperature, e.g. $1000\text{--}1100^\circ\text{C}$, than those used in the prior art, e.g. $1350\text{--}1500^\circ\text{C}$. Much of the B_2O_3 remains unreacted with the silica particles it helps to sinter, acting like a flux to bring about consolidation. This
10 remaining B_2O_3 is removed at the conclusion of the consolidation procedure by steam treatment at temperatures of 900°C - 1100°C . Some boron is incorporated into the silica layer, changing its CTE without substantially increasing its index. Thus, this method improves both structure and processing of planar waveguides by reducing the processing temperature and producing a glass which does not bow the
15 substrate and essentially eliminates birefringence resulting in polarization dependent losses. This greatly benefits sophisticated circuits such as those intended for wavelength diversion multiplexing and allows narrow and precisely positional pass bands.