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Measurements of Attenuation Losses and of Light Distribution in Thick-Film Optical Waveguides

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The attenuation characteristics of thick-film optical waveguides have been measured using the scattering distribution method. The attenuation of EMCA Glass 92 on Heraeus IP041 was found, for all waveguides, to be within 6 dB/cm. Scattering was seen to be fairly uniform throughout the waveguide, apart from isolated localized scattering points in some cases. The measurements show promise in relation to the use of thick-film waveguides in sensor technology.

1. Introduction

Optical sensors are very important in modern metrology and quality control in manufacturing. However, there are still limitations in the use of such sensors in mass production: (i) the cost of bulk optics, and (ii) the technological impact of integrated optics. On the other hand, hybrid technology using thick-film sensors has reached maturity in nonoptical sensor technology, due to the ease of fabrication of low-cost and reliable sensors. The development of thick-film optical waveguides would therefore be beneficial for the development of low-cost optical sensors.

Sensors that can be developed with thick-film structures range from intensity sensors and polarization-sensitive devices, to phase-sensitive devices (such as Mach-Zehnder structures).

Thick-film waveguides have been investigated in the past as a low-cost approach to optical communication devices,[1,2] and the attenuation characteristics of waveguides of