A theoretical and experimental thermal study of SiO₂ optical fibres transmitting concentrated radiative energy

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Abstract
In this work a theoretical and experimental thermal behaviour study of optical fibres with a high-purity SiO₂ core transporting concentrated radiative energy is carried out. A theoretical unidimensional model for the simultaneous transport of heat by conduction and radiation in optical fibres, including the heat losses by convection at the surface, is developed. This model considers a constant linear absorption coefficient and it is solved analytically. An experimental method to determine the linear coefficient of absorption is developed. The time evolution of the axial temperature distribution of two kinds of fibres is recorded and compared with the theoretical predictions. These experimental results validate the theoretical model proposed.