A thermal study of optical fibres transmitting concentrated solar energy

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Abstract. In this paper we develop a theoretical thermal study of optical fibres transmitting concentrated solar energy. An energy equation for simultaneous conduction and radiation of heat through optical fibres is obtained. To transmit concentrated solar energy an optical fibre tip is placed in the focus of a small paraboloidal mirror. The role of aluminium and silver as the reflective surface on the mirror that allows one to concentrate the solar energy is studied. The power supply is estimated to be 26 W at the end of a 10 m long fibre with 88% transmission efficiency. The thermal study considers a wavelength-dependent absorption coefficient of the optical fibre core in order to obtain the radiative heat flux in the fibre. With this result we predict that the fibre can be used 6 h.