# Sub-wavelength light confinement in optical fibres and tapers using surface plasmons

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**Abstract:** Light confinement beyond the diffraction limit is proposed in optical fibres and fibre tapers by exploiting surface plasmons (SPs). To achieve high transmission efficiency, light is converted into SPs at the fibre/taper tip and then converted back into light. Indeed SPs can be confined to dimensions smaller than diffraction limit, but they require stringent conditions for their excitation: the light incidence angle depends on the wavelength (Figure 1a) and it has a strong dependence on the taper diameter (Figure 1b). For this reason fibre/taper nanostructuring needs to be extremely accurate.
In this work, optical fibres and fibre tapers (Figure 1c, 1d) have been nanostructured to achieve highly efficient SPs excitation and high transmission efficiency. The effect of different milling shape on transmission has also been analyzed. Transmissivities as high as 7% have been observed.

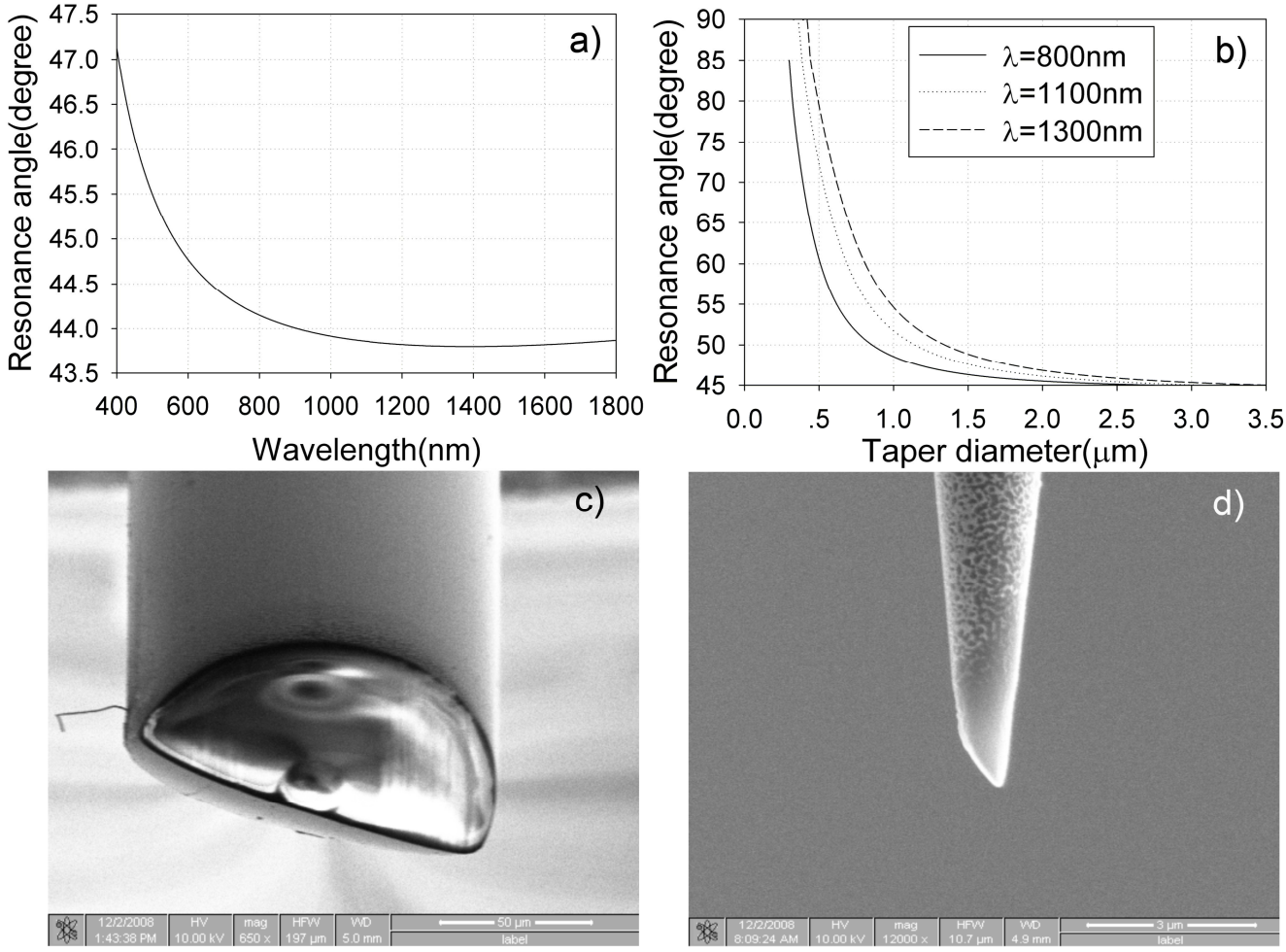


Fig. 1 (a) Dependence of the SPs resonance angle α on the light wavelength for telecom optical fibers, (b) Dependence of the SPs resonance angle α on the taper diameter for fibre tapers, (c) SEM image of the structured optical fibre sample, (d) SEM image of the fibre taper sample.

**References:**

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