Simulating Wet Etching Of Optical Fiber To Fabricate NSOM Probe

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Abstract

Near-field scanning optical microscopy (NSOM) unifies the potential of scanning probe technology with the power of optical microscopy as if like having eyes into the nanoworld. To efficiently channel the illumination light to the tip apex and acquire optical images beyond the diffraction limit, NSOM probes need a subwavelength optical aperture with a wide cone angle of the probe. Hydrofluoric acid (HF) chemically etches optical fiber to form a cone-shaped NSOM probe and the cone angle of the probe is dependent on the etching time. We investigated the wet etching process of the optical fiber and determined the main factors and mechanism of the etching process using COMSOL Multiphysics®. We used the "Transport of Diluted Species" as well as the "Deformed Geometry" physics interfaces in our COMSOL® model. In this project, cone angles of simulated NSOM probes with variable etching time were compared with the experimental data.

Figures used in the abstract

Figure 1 : Simulated etching of optical fiber after 160 minutes forming cone-shaped NSOM probe.