Adhesion Force Studies of Nanofibers and Nanoparticles

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Supplementary information:

The FEM model of the deflection of an AFM cantilever with a nanoparticle in contact with a nanofiber

The mechanical properties of the materials used in FEM are provided by the manufacturer. The cantilever has a spring constant of 0.58N/m and an elastic modulus of 160 GPa; the PS particle and nanofiber have an elastic modulus of 3.25 GPa, a passion ratio of 0.34. The loading and constraint conditions used in the FEM analysis are:

1) In order to simulate the displacement of particles, the displacement of bottom line of fiber was assigned zero displacement in x, y and z direction (ux, uy and uz =0). The displacement loading on the AFM cantilever was 0.6 µm.

2) Element type for AFM cantilever, particle and fiber was solid 185.

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The result is shown in Figure S1 A (showing the whole cantilever) and B (showing the vicinity area of the particle): the maximum deformation of the particle is about 5 nm with a 0.6µm of displacement loading applied on the cantilever, which is corresponding to the Z-piezo traveling distance from the touching point (when approaching) to the retraction starting point.

A. The deformation of AFM cantilever, particle and fiber

C. Local deformation of the particle and fiber

Figure S1. The FEM model of the deflection of an AFM cantilever with a nanoparticle in contact with a nanofiber (units: mm).