# Supporting Information

# Contact mechanics of UV/ozone treated PDMS by AFM and JKR testing: Mechanical performance from nano-to micrometer length scales

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## 1. Representative stress and strain curves of untreated and 60 min treated PDMS.

Bulk mechanical properties are usually obtained by tensile and bending tests. Figure S1 shows the stress-strain curve of treated and untreated PDMS samples. It can be seen that the Young modulus, measured as the initial slope of the stress-strain curves of untreated PDMS and 60 min treated PDMS are essentially identical. Therefore, it can be concluded that UV/ozone surface treatment does not affect the PDMS bulk mechanical properties.

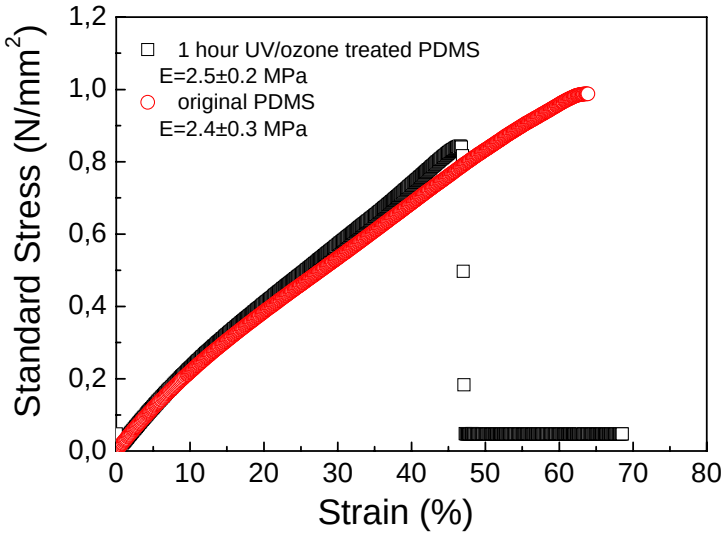


**Figure S1.** The stress strain curves of untreated and 60 min treated PDMS.

For stress and elongation at break, as in most cases, samples broke at the clamp. This is typical for PDMS, as the tear strength of PDMS is so low. The calculated PDMS bulk modulus is consistent with literature data.

## 2. Detailed calculation of Young's modulus with continuum contact mechanics theory for AFM experiments by employing the hyperboloid tip shape model.

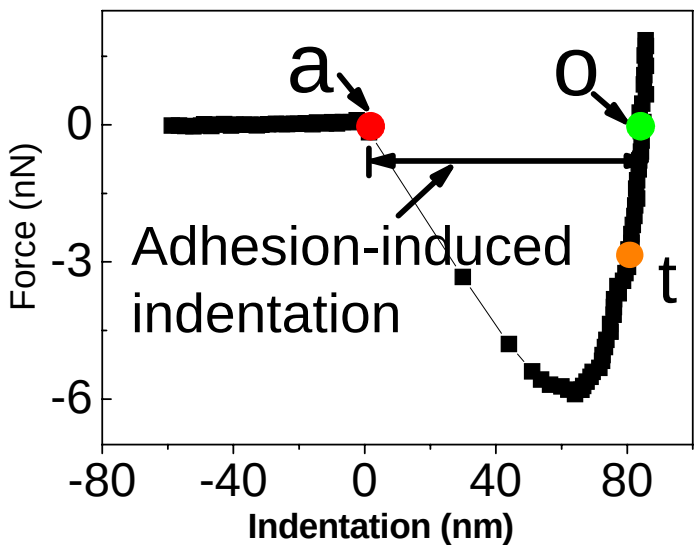


**Figure S2.** A force vs. indentation curve of untreated PDMS.

At point "o" there is a zero external force on the AFM cantilever, $P_o = 0$ and indentation $\delta = \delta_o$, so from Eq.2 (in the paper), it is obtained

$$\frac{A}{2R}\left[a_o A + \frac{a_o^{\,2} - A^2}{2}\left(\frac{\pi}{2} + \arcsin\frac{(a_o/A)^2 - 1}{(a_o/A)^2 + 1}\right)\right] - a_o\left(\frac{2a_o\pi(1-\upsilon^2)W_{12}}{E}\right)^{1/2} = 0 \qquad \text{(S1)}$$

And from Eq.3 (in the paper)

$$\frac{a_o A}{2R}\left[\frac{\pi}{2} + \arcsin\left(\frac{(a_o/A)^2 - 1}{(a_o/A)^2 + 1}\right)\right] - \left(\frac{2a_o\pi(1-\upsilon^2)W_{12}}{E}\right)^{1/2} - \delta_o = 0 \qquad \text{(S2)}$$

Thus, $a_o$ and $(W_{12}/E)$ are solved from Eq.S1 and S2.

Point "t" is any other point at the contact portion of approaching curves. At point "t", the external load $P = P_t$ and indentation $\delta = \delta_t$ so from Eq.S1 and S2, one obtains

$$\frac{a_t A}{2R}\left[\frac{\pi}{2} + \arcsin\left(\frac{(a_t/A)^2 - 1}{(a_t/A)^2 + 1}\right)\right] - \left(\frac{2a_t\pi(1-\upsilon^2)W_{12}}{E}\right)^{1/2} - \delta_t = 0 \qquad \text{(S3)}$$

$$\frac{2E}{1-\upsilon^2}\left[\frac{A}{2R}\left[a_t A + \frac{a_t^{\,2} - A^2}{2}\left(\frac{\pi}{2} + \arcsin\frac{(a_t/A)^2 - 1}{(a_t/A)^2 + 1}\right)\right] - a_t\left(\frac{2a_t\pi(1-\upsilon^2)W_{12}}{E}\right)^{1/2}\right] - P_t = 0 \qquad \text{(S4)}$$

The unknown values in Eq. S3 and S4 are E, $W_{12}$, and $a_t$, so knowing the ratio $(W_{12}/E)$, one can calculate the Young's Modulus at each point "t", i.e. as a function of indentation depth.