## PDMS/TiO<sub>2</sub> Microfluidic Systems with enhanced Wettability upon UV irradiation

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## FT-IR spectra of PDMS/TiO<sub>2</sub> NRs nanocomposite samples.

The FT-IR spectra of PDMS-based nanocomposite samples before and after UV irradiation and after vacuum storage were collected in order to elucidate the hydrophilicization mechanism (Figure S1). The results show that the process affects almost exclusively the OH band (3100-3500 cm<sup>-1</sup>), which appear to exhibit a higher intensity only after UV irradiation, as expected.



**Figure S1.** FT-IR spectra of PDMS/TiO<sub>2</sub> nanocomposite samples before and after irradiation and after vacuum and dark storage.

## AFM phase images of PDMS pure elastomer and PDMS/TiO<sub>2</sub> NRs nanocomposite samples.

The actual presence of the NRs on the nanocomposite surface is further supported by AFM phase images (Figure S2). Phase imaging is quite effective for mapping the submicron features of multicomponent polymer systems based on the relative elasticity of individual components, thus permitting the existence of different materials forming the samples surface to be identified. In particular, the pure PDMS sample (Figure S2a) shows a flat and homogeneous surface, without significant features, thus appearing composed of just one material, which can only be the elastomer itself. On the contrary, Figure S2b demonstrates that the addition of NRs to the elastomeric matrix leads to changes in the phase image, to such a great extent that the surface appears to be made of two different phases, and thus of two different materials.



**Figure S2.** AFM phase images of (a) pure PDMS and (b, c) different areas of a PDMS/TiO<sub>2</sub> NRs nanocomposite (4  $\mu$ m×4  $\mu$ m). In particular, panel c shows the presence of NRs exposed on the nanocomposite surface.

In particular, the dark domains correspond to a soft material, i.e. the elastomer,<sup>1,2</sup> whereas the lighter expanded regions are associated to a harder material, and we assume that these are the areas where the elastomer and nanofillers are homogeneously mixed together. In addition, in some cases, we could also find surface areas which are characterized by the presence of a third region, attributed to the existence of an even harder material, which can only be the NRs,<sup>1,2</sup> that appear to be organized in large aggregates randomly dispersed along and exposed on the nanocomposite surface.

## References

- A. Di Gianni, S. Trabelsi, G. Rizza, M. Sangermano, H. Althues, S. Kaskel and B. Voit, Macromol. Chem. Phys., 2007, 208, 76.
- 2. M. Song, H. S. Xia, K. L. Yao, and D. J. Hourston, Eur. Polym. J., 2005, 41, 259.