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Surface properties of microplastic particles matter for particle-cell-interactions

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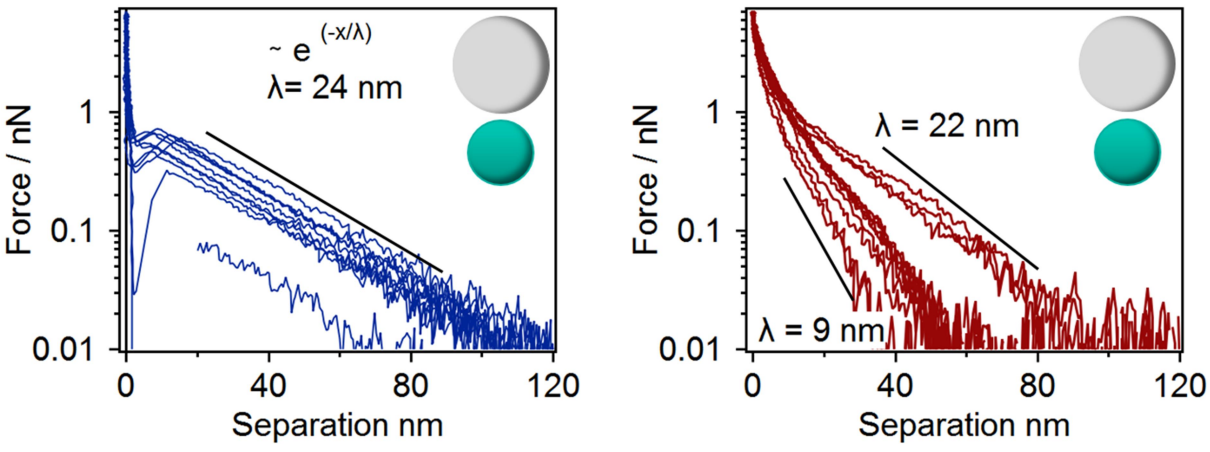
Plastic pollution has been shown in all environmental compartments ranging from the marine and limnetic environment (Imhof et al., 2013), terrestrial ecosystems, like agricultural soils right up to the atmosphere. To date, plastic particles have mainly been categorized by polymer type, shape, and size (Cole et al., 2011). But there is another important issue arising when investigating microplastic and its interaction with cells. With decreasing size, the surface-volume ratio increases which makes surface properties more important to take into account. It is generally believed that the surface properties of the particles influence the cell interaction. Therefore, we investigated un-functionalized polystyrene particles with the size of 3 µm with different surface properties of two different manufactures. We found out that the cellular interaction and uptake of microplastic particles (polystyrene) differs for the two particle types. Using Zeta-Potential measurements and Colloidal Probe-Atomic Force Microscopy (CP-AFM) we could show a significant difference in the electric surface properties: homogeneously charged particles vs. heterogeneously charged particles. The heterogeneous surface charge manifests itself in an electrostatic interaction of the particles that depends on the mutual orientation of the particles. CP-AFM is therefore a magnificent tool to obtain additional informations about surface charge and it's distribution on microplastic particles.

[1] Imhof et al., Curr Biol.;23(19):R867-R868, 2013
[2] Cole et al., Marine Pollution Bulletin, 62(12):2588-2597, 2011

1. Microplastic particles (polystyrene) can have same size, shape but **different** surface properties
2. Surface properties of microplastic particles matter for particle-cell-interactions
3. Classification of microplastic particles according to size, shape, polymer type **and** surface properties necessary



Abstract