Microfluidic high-throughput synthesis of form anisotropic plasmonic nanoparticles

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Metal nanoparticles (meNP) have the unique feature to exhibit localized surface plasmons while stimulating them with light containing the resonance frequency. This effect is known as *Localized Surface Plasmon Resonance* (LSPR) and is based on density oscillations of the trapped conduction electrons as a result of the external excitation by a light beam. The occurring resonance frequency is therefore delicate to changes in the meNP proximity (surrounding), which gives the opportunity to utilize them as label-free sensors for bioanalytics.[1] Further influences on the resonance frequency are attributed to the composition, size and shape of the meNPs.[2] Focusing in general on a narrow size distribution to get a sharp resonance peak, the shape also affects the sensitivity of the biosensor. Since form anisotropic meNP have a field enhancement at corners and tips, they have an increased sensitivity to changes in the surrounding.
However, the synthesis of form anisotropic meNPs is a complex and challenging process and needs a high control of the reaction and the certain synthesis steps. At this point starts the limitation of the classical synthesis methods and new or more efficient routes are needed. A promising strategy is the transfer of the synthesis or crucial post-synthetic growing steps into microfluidic systems. Therefore we will present the potential of a microfluidic set-up for the synthesis of silver nanoprisms (Fig.1a) and gold nanocubes (Fig.1b). [3, 4] By using appropriate micro mixers a fast and reproducible synthesis is achieved which on the one hand higher the yield of the desired shapes but on the other hand reduces the consumed material.

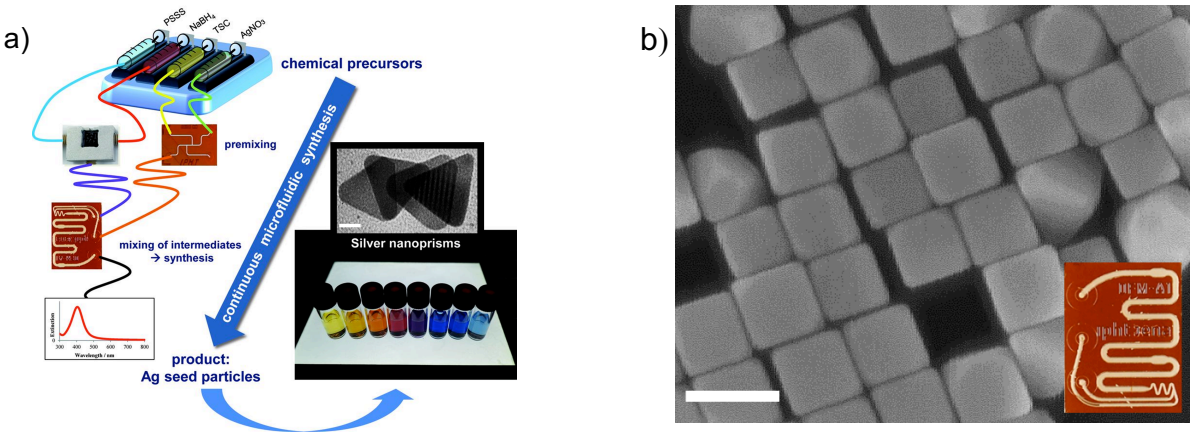

Fig 1: a) Micro continous flow synthesis plattform for the production of silver nanoprisms (scale bar 20 nm). b) SEM image of gold nanocubes (bar 100 nm) and picture of the micro mixer (same bar 10 mm) that was used for the synthesis.

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2. M. Thiele, I. Götz, S. Trautmann, R. Müller, A. Csáki, T. Henkel and W. Fritzsche, *Materials Today: Proceedings*, 2015, **2**, 33-40.
3. M. Thiele, A. Knauer, A. Csáki, D. Mallsch, T. Henkel, J. M. Köhler and W. Fritzsche, *Chem Eng & Tech* 2015, **38**, 1131-1137.
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