Nanoparticle Synthesis in Flow

Master Thesis Project – Kasper Moth-Poulsen Group

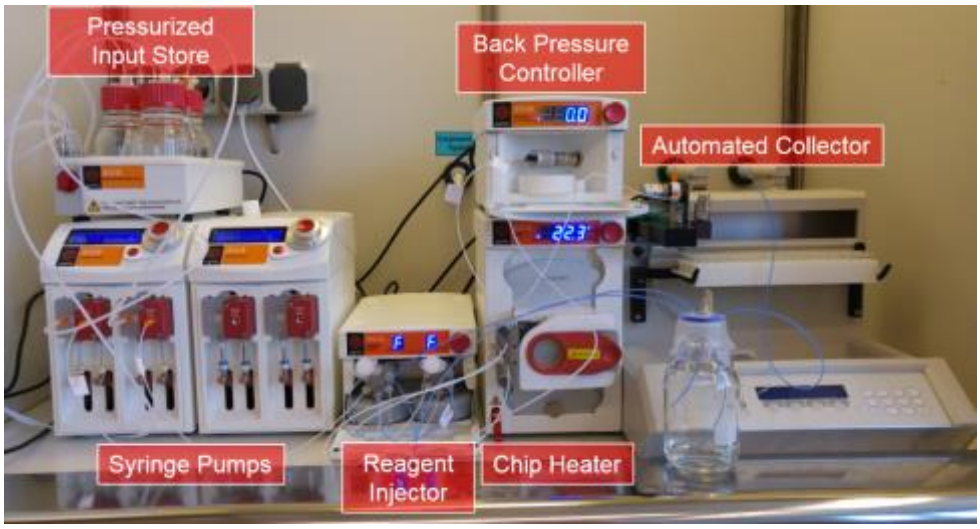

Fig. 1 Asia flow system (installed in lab 8120)

We are proposing **a master thesis project** employing a state of the art flow system to noble metal (Au, Ag) nanoparticle synthesis. You will have the opportunity to learn the use of a **flow system**, and the **synthesis, handling and characterization of nanoparticle solutions** - all of which are desired skills for modern industrial applications in chemical, biochemical or pharmaceutical fields, and in the academic research. The aim of the project is for the student to **optimize the product properties of Au and Ag nanoparticle synthesis** by exploring working conditions on the flow system.

Flow chemistry is an **emerging field of chemistry** which deals with the development and application of flow reactor systems. The principle of flow chemistry is that two or more reagent solutions are pumped through narrow channels and are reacted by mixing them in special devices such as micro-chips or by simply combining them at a Y-junction.

Noble metal nanoparticles are interesting for many applications mainly because of two defining properties. (i) The emergence of the **plasmon resonance** in finely dispersed metals. (ii) Their **high surface to volume** ratio. These properties can be used for **applications in sensing and catalysis**. But, as these two properties strongly depend on the size and shape of the individual particles, to examine them properly, samples of particles with uniform sizes and shapes are in need. This is where the **flow system offers** the possibility to increase the quality of the nanoparticles beyond state of the art by **automatizing mixing, by minimizing temperature and concentration gradients**, and by allowing **fast screening of reaction conditions.**

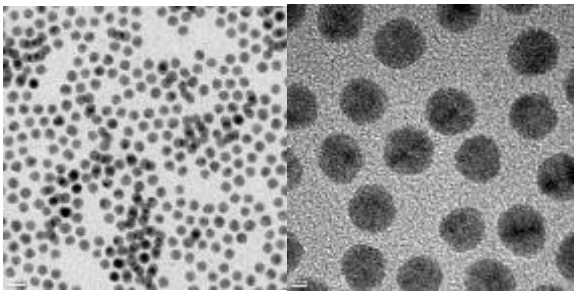

Fig. 2 TEM images of AuNP on carbon film

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