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Project : Synthesis of Silicon nanoparticles for Solar Cells
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Introduction

Fluorescent silicon nanoparticles (Si NPs) are interesting candidates in the area of quantum dots, because of their low toxicity, high brightness, and stability against photo bleaching. Their photoluminescence properties are size dependent, however, preparing nanoparticles of a specific size remains an complicated issue. In collaboration with Delft University, we are investigating the application of Si NPs in solar cells.

Goal

The aim of this project is to synthesize Si NPs. We will focus on further optimizing the synthetic procedure, and scaling up the reaction. Si NPs obtained via our current synthetic approach still have a rather broad fluorescence emission, and we are therefore investigating separation based on size. Furthermore, the absorption of these Si NPs is mostly in the UV, while it would be desirable if this were in the visible spectrum. We will try to prepare mixed silicon/germanium nanoparticles, in order to shift the absorption

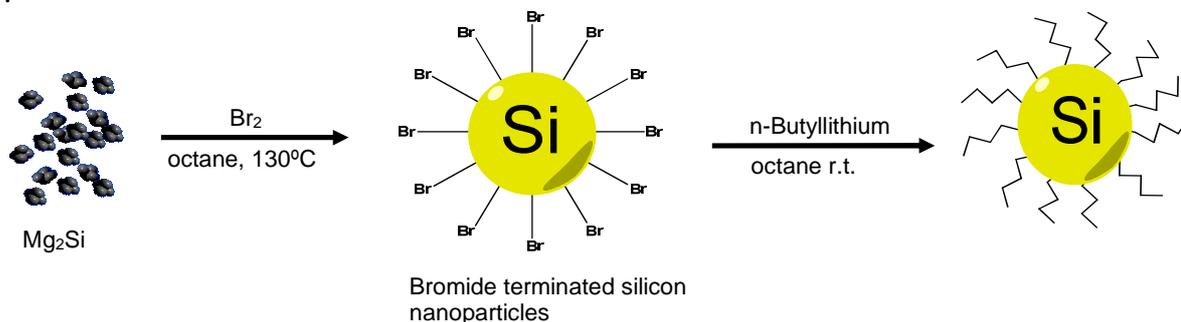


Figure 1: Schematic representation of the formation of Butyl capped Si NPs via oxidation of Magnesium silicide.

Progress achieved

The Si NPs were synthesized by oxidation of magnesium silicide by bromine, which afforded bromine terminated Si NPs. These bromine terminated Si NPs are susceptible to oxidation. To avoid oxidation, the particles were capped with n-butyl groups. After two consecutive column purifications pure Si NPs were obtained. Their characterisation includes NMR, IR, UV-fluorescence studies and TEM, is underway.

Further research

Our goal is to develop a well established recipe for synthesis of Si NPs with good purity and in high yields. In the near future, different alkylgroups will be attached onto the surface. Separation of the Si NPs on size will be investigated in more detail. New synthetic approaches towards Si NPs will be attempted, with the aim to produce Si NPs in larger quantities, which can then be fractionated to yield to appropriate size particles.

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References

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