## Influence of Oxygen on Photochemical Transformation of Silver Nanoparticles

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## **Extended Abstract**

Light is a valuable tool for formation of various metallic nanostructures. In 2001 Jin *et al.* (2001) reported a photochemical transformation of silver nanoparticles during light illumination; initially spherical Ag nanoparticles turned into nanoprisms. It is possible to control the final geometry of obtained silver nanoparticles by changing the wavelength of the excitation radiation. In 2011 Zhang *et al.* (2011) demonstrated that using different starting silver seeds it is possible to obtain different final nanoparticles, like nanoprisms or nanorods. The photochemical method of synthesis of highly anisotropic metal nanoparticles is much more pure then the standard chemical synthesis. Photochemical method does not require the addition of a chemical compound leading to the anisotropic growth of the nanoparticles. Often removal of such compound is extremely difficult, moreover, sometimes along with the removal of the stabilizer significant changes of the shape of nanoparticles is observed. The photochemical synthesis of silver nanoparticles allows to obtain nanoparticles with low dispersion of the size.

The standard photo-transformation is a result of two consecutive processes: a) slow dissolution of silver nanoparticles under the influence of an oxidant present in the solution, b) photochemical reduction of silver ions at the specific sites of the nanoparticles. As far as we know in all previous photochemical transformations reactions oxygen was used as an oxidizing agent. In this work we present the first example of a photo-transformation process of silver nanoparticles in oxygen-free conditions. As an oxidizing agent 1, 4-benzoquinone has been used. The presence of 1, 4-benzoquinone allows to maintain a constant potential during the whole process.

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Jin, R., Cao, Y.W., Mirkin, Ch. A., Kelly, K.L., Schatz, G.C., & Zheng, J.G. (2001). Photoinduced Conversion of Silver Nanospheres to Nanoprisms. *Nature*, 294, 1901-1903.

Zhang, J., Langille, M.R., & Mirkin, Ch.A. (2011). Synthesis of Silver Nanorods by Low Energy Excitation of Spherical Plasmonic Seeds. *Nano Letters*, *11*, 2495-2498.