The effect of $NaBH_4$ aging on the gold nanoparticle morphology

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$NaBH_4$ is a powerful reducing agent used for various synthesis of organic and inorganic materials. However, when it is prepared as an aqueous solution, hydrogen gas is released immediately and decomposes gradually. Thus, the ability of $NaBH_4$ as a reducing agent varies with time, consequently affecting the reproducibility of the chemical reaction. To quantitatively examine such $NaBH_4$ aging phenomena, we employed the synthesis of gold nanorods as a model system. We analyzed the particle shape change over time using a continuous flow microreactor system. We found that the shape and aspect ratio of the gold nanorods depended strongly on the injection time of the prepared $NaBH_4$ solution. The experimental results demonstrated that the efficiency of $NaBH_4$ as a reducing agent greatly affected the seed formation of the gold nanorods and consequently determined their final morphology.