

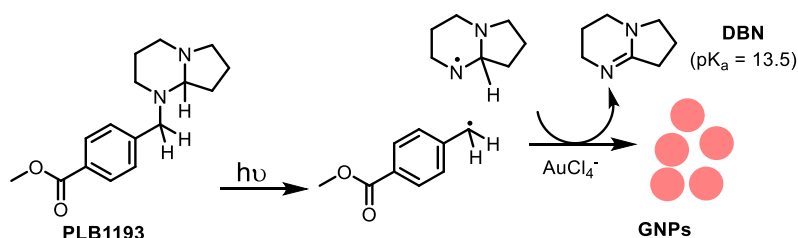
UNVEILING THE POTENTIAL OF PHOTOBASE IN PHOTOSYNTHESIS OF GOLD NANOPARTICLES IN ORGANIC SOLVENT

Cuong-Minh-Quoc Le^{1,2}, Quentin Bauerlin^{1,2}, Karine Mougin^{1,2}, Arnaud Spangenberg^{1,2}

¹ Université de Haute-Alsace, CNRS, IS2M UMR7361, F-68100 Mulhouse, France

² Université de Strasbourg, France

Gold nanoparticles have attracted the greatest interest in nanoscience and nanotechnology due to their intriguing electronic, chemical, and optical properties (notably plasmonic effects)¹. In this study, we introduce a novel and scalable photochemical method for synthesizing small-sized gold nanoparticles in alcoholic solvents, employing a photolabile base or photobase for the first time. The process relies on the use of an oil-soluble photobase derived from an amidines base (namely PLB1193, as shown in scheme below). Under UV-irradiation, this photobase undergoes Norrish type I cleavage, generating primary radicals and subsequently releasing a strong base^{2,3}. These radical species play a key role in reducing gold ions to their atomic form, facilitating nanoparticle growth. The influence of solvent types, stabilizer, irradiation parameters were systematically studied under batch conditions, which has been successfully translated into a commercially available photochemical reactor. Furthermore, we also demonstrated that PLB1193 is a straightforward and efficient reducing agent for preparing gold nanoparticle in acrylate resins, opening the door to nanocomposite applications. The method outlined in this research paves the way for numerous opportunities to explore the potential applications of photobases and photoacids for the preparation of gold and potentially other noble metal nanocomposites.



SchemeError! No text of specified style in document.-1 Photochemical cleavage of the amidine derivative PLB-1193 to release of DBN and simultaneous preparation of GNPs

References

1. Saha K., Agasti S. S., Kim C., Li X., Rotello V. M., Chem Rev, 112, 2739-2779, 2012.
2. Dietliker K., Jung T., Benkhoff J., Kura H., Matsumoto A., Oka H., Hristova D., Gescheidt G., Rist G. n., Macromolecular Symposia, 217, 77-98, 2004
3. Sangermano M., Vitale A., Dietliker K., Polymer, 55, 1628-1635, 2014.