Gold nanoparticles are one of the most interesting nanomaterials because of their emerging applications in a variety of subject areas such as nanotechnology, biosensors, medicine, and nanoscience. In the nanoscale, the properties of materials in this dimension changes completely and becomes materials with unique and interest physical and chemical properties compared to the bulk metal gold (Au), leading them to perform in an unexpected and potentially viable way.

In this research, gold nanoparticles (Au NPs) were successfully synthesized and characterized to confirm the formation of gold nanoparticles using various analytical techniques such as transmission electron microscopy (TEM), and UV-visible spectroscopic measurement. Au NPs are generated through conventional methods such as Brust–Schiffrin method with our modification\textsuperscript{51} using the alternative alkanethiol ligand that is 1-hexanethiol. This synthesis followed standard procedure with one reaction condition varying: the mole ratio of NaAuCl$_4$·2H$_2$O:1-hexanethiol. Four different ratios of Au NP samples were prepared and characterized and preliminary results show that the particle size varies from ~4.5, ~2.7, ~1.9, to
~1.1 nm when the mole ratio of Au to 1-hexanethiol change, and it is found that the Au NPs sizes decreased with increasing thiol-Au ratio.