# Measurement of the effects of Accelerated Aging of Gold and Silver Nanoparticles

Application Note 120

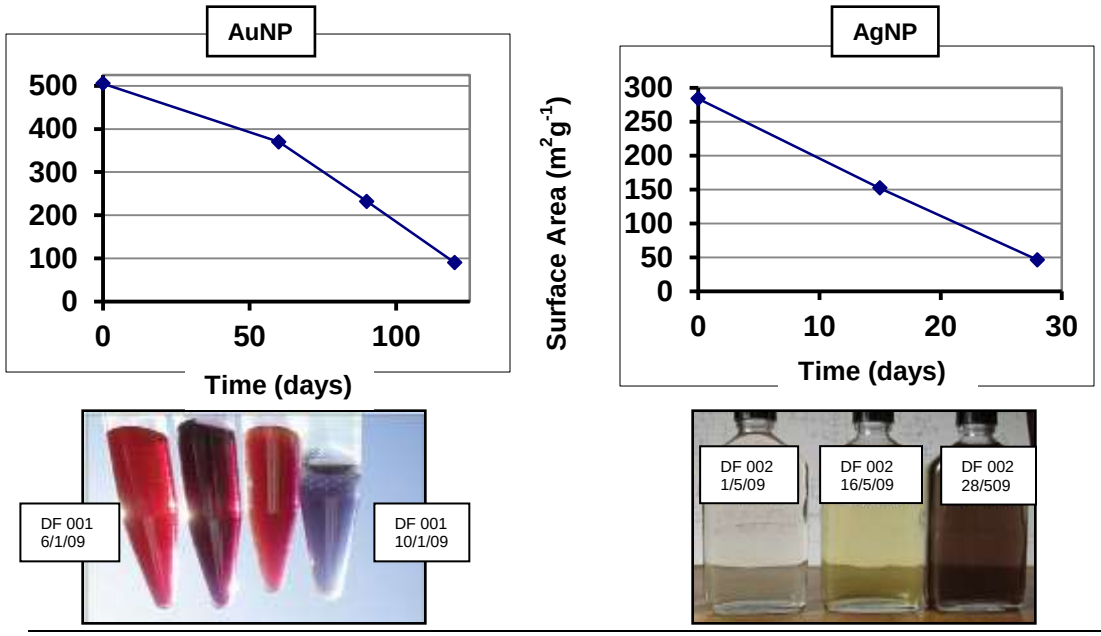
Nanoparticles of both gold (AuNP) and silver (AgNP) are the subject of substantial research owing to their unique and attractive physical and chemical properties. These include high thermal and electrical conductivity, photothermal response and tunable optical properties. Both AuNP and AgNP are used in numerous applications such as organic photovoltaics, sensory probes, imaging, diagnostics, therapeutic agents, drug delivery, electronic resistors and capacitors, catalysis, conductive inks and coatings; an increasingly common application of AgNP is for their antimicrobial properties.

The properties and applications of AuNP and AgNP are critically dependent upon their size and shape even spherical particles may not be completely smooth. This large surface area-to-volume ratio that enables their surface to be coated with hundreds of molecules (including the therapeutics, targeting agents, and anti-fouling polymers).

Many AuNP and AgNP are created *in situ* by nucleation/precipitation processes in both aqueous and non-aqueous media, and at a variety of concentrations. Thorough characterization is, therefore, paramount in obtaining optimum performance features and cost effective benefits from such systems. The XiGo Acorn Area is a small, patented bench-top NMR device that allows direct determination of the total wetted surface area of AuNP and AgNP as they are prepared and without dilution. It can also be used to study the adsorption of surfactants and polymers onto their surface.

To understand the effects of storage conditions on shelf-life, formulations are stored under standardized test conditions and carefully examined at periodic intervals; regulated products must be tested in compliance with, for example, applicable ICH guidelines.

It is known that the color of both AuNP and AgNP changes as the particle size increases. This can be used to qualitatively gauge the onset of aggregation. If aggregation occurs, the total wetted surface area markedly decreases. This can be determined *quantitatively* from NMR relaxation using the Acorn Area. Importantly, since the measurement is non-invasive and non-destructive, samples can be stored under any conditions and then re-analyzed at any later period(s). The Figures show data for samples of AuNP and AgNP stored at 40°C and measured over four months and four weeks, respectively.

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