

Surface Plasmon Resonance (SPR)

Nanoparticles in colloidal form often display characteristic colours as a result of their unique physical properties. As shown in figure 1, when light shines on the surface of a bulk metal, conduction electrons move collectively to screen the perturbed charge distribution caused by the light's electromagnetic energy. This "surface plasmon resonance (SPR)" is a collective excitation mode of the plasma localised near the metal surface and produces the shine associated with a metal.

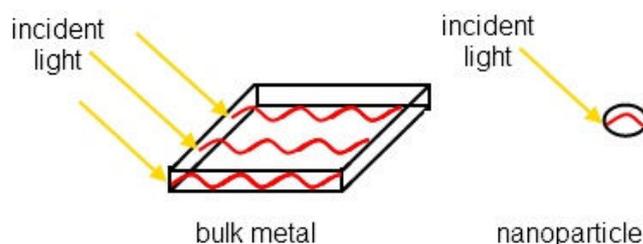


Figure 1: Surface plasmon resonance in metals

In the case of metal nanoparticles, the surface plasmon mode is 'restricted' due to the small dimensions to which the electrons are confined. Therefore, the resonance frequency of the surface plasmon oscillation of the metal NP is different from that of the bulk metal.

This effect alters the optical properties of the nanoparticles and influences the spectral profile of the light scattered by the SPR of the metal nanoparticles. Gold and silver are among the metal nanoparticles known to exhibit SPR. Factors affecting a colloids colour include the source metal the size range, and the shape of the nanoparticles within.



Figure 2: Silver (left) and gold (right) nanoparticle colloids. Differences in particle size cause the silver nanoparticles to display different surface plasmon resonances and hence different colours