

### Magnetic-photocatalytic hybrid nanoparticles as a gravimetric immunoassay probe

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Highly crystallized and monodispersed magnetic-photocatalytic hybrid nanoparticles are synthesized as an effective immunosensor probe. The probe particles comprise iron oxide/titania core/shell structures which are magnetically separable photocatalysts. Thin silica layer was coated as a barrier layer between magnetic core and titania shell to prevent photodissolution in hybrid nanoparticles. Alphafeto protein (AFP) antibody conjugated hybrid nanoparticles bind to AFP antigen on a silicon microcantilevers, and unbound nanoparticles are separated by magnetic field. When the nanoparticles are exposed to UV light in a silver nitrate solution, silver ions are photocatalytically reduced onto the nanoparticles and deposition of silver induces a decrease in the resonance frequency of the silicon resonator. The photocatalytic silver reduction enhances the mass of the adsorbed AFP, and the frequency change after photocatalytic reduction is much larger than that due to antigen binding alone. Since this method is more economical, more sensitive and easier to control, it has significant potential as an elegant alternative to the conventional method that uses gold nanoparticles as a reducing agent.