Launching low energy surface plasmons in purple gold (AuAl$_2$)

PANUPON SAMAIMONGKOL, HANS D. ROBINSON, Department of Physics, Virginia Tech, Blacksburg, Virginia 24061, USA — The intermetallic compound AuAl$_2$ is sometimes known as “purple gold” due to its intense purple color. It was long assumed this color originated from an interband absorption transition, but, as has recently be pointed out [1], it is related to a surface plasmon resonance which exists in this material at a lower energy than in any of the pure metals (including Au, Ag, Cu, etc.). Thin films of purple gold can readily be prepared by layered evaporation of Au and Al in the proper ratios, followed by annealing at moderately elevated temperatures. Fabricating AuAl$_2$ films on the hypotenuse of high index glass prisms, we have been able to launch surface plasmons in this material in the Kretschmann configuration, from which we directly extract the dispersion relation of surface plasmons, in good agreement with predictions from previous measurements of its dielectric function. Surface plasmon sensing results using AuAl$_2$ will also be presented. Finally, we will discuss the possible applications for purple gold in nanoparticle form, where it has the property of being an excellent light absorber across the entire visible spectrum.