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Analysis of Au-Al thin films for application in surface plasmon resonance sensing devices[1] MOLLY KATE KREIDER, ABDUL QADEER REHAN, ROBERT KENT, MARIAMA REBELLO SOUSA DIAS, University of Richmond — Surface plasmon resonance (SPR)-based sensing devices commonly use Au due to its robust, well-defined SPR response. Such devices aim to detect small changes in the index of refraction of a medium and thus rely on materials exhibiting a sharp, well-defined resonance dip in their reflection spectrum. The resonance dip of Au loses definition at high temperatures, making it ill-suited to application in high-temperature sensing devices. In this work, we study the SPR response of thin films of various alloys of Au and Al fabricated using the co-sputtering deposition method and characterize their optical response over a wide range of temperatures (from 25 to 200 °C). We quantify three figures of merit in sensing applications: the sensitivity of the dip's location in the reflectance spectra, the full width at half maximum (FWHM) and the height of the reflectance dip. An ideal film exhibits a high sensitivity, small FWHM, and large peak height. We perform a full analysis of each of these metrics at both fixed incident angle (for wavelength-dependent sensors) and fixed incident wavelength (for angular dependent sensors), for four thicknesses. All alloys outperform their pure counterparts in sensitivity for the wavelength-dependent SPR sensor, with $Au_{.85}Au_{.15}$ being more sensitive than its pure counterparts in every configuration we examined for both angular and wavelength-dependent SPR sensors and remained relatively comparable to its pure counterparts in terms of FWHM and peak height.

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Molly Kate Kreider
University of Richmond

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