Surface plasmon resonance biosensor based on characteristic biomolecular vibrations

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Abstract: Surface plasmon resonance biosensors are well established at visible and near-IR wavelengths, but sensitivity and selectivity might be enhanced if they were operated instead in the infrared molecular-finger print region of characteristic vibrations. Needed are surface plasmon hosts with plasma frequencies one order lower than found in noble metals, so that modes are sufficiently confined to adequately overlap with biological analytes. Also, for sharp resonances, sufficiently long electron relaxation times are needed. Original complex permittivity data was collected to theoretically evaluate the potential of silicides, heavily-doped semiconductors, semimetals, and conducting polymers. Resonant absorption by surface plasmons of long-wave IR laser radiation was measured using lamellar grating couplers and prisms coated with suitable materials to experimentally verify the predictions.