Measurement of THz performance of plasmonic absorbers made of bulk aluminum

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Abstract—Opaque metal films with periodically arranged subwavelength size holes have demonstrated strongly enhanced light transmission acting as optical filter for certain wavelengths [1]. The ability to engineer the spoof plasmons at almost any frequency in the THz regime were proposed recently [2]. It was demonstrated that the subwavelength holes in a perfect conductor give rise to similar anomalous transmission of electromagnetic waves via the spoof plasmons excitation effects. The change of dielectric medium at the surface of THz filter revealed the red-shift of the resonance peak demonstrating the enhanced surface plasmons excitation and interaction with localized plasmons modes [3-4].

In this work, the resonant apertures of different shape and size were processed periodically in a bulk aluminum using the direct laser writing (DLW) technique [5]. The reflection spectra were measured with a vacuumed far-infrared Fourier transform spectrometer at different incidence angle. To observe THz plasmons modes accurately, spectra were recorded with the spectral resolution of 2 cm^{-1}. It was found that the number of peaks, the peak position, and the line width were controlled in the THz regime via the change of initial groove parameters.

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