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Title:Extraordinary Transmission through Fractal-featured Metallic and Superconducting Films at Terahertz Frequency
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Abstract:We report on fractal-featured square and ring-shaped apertures with a Sierpinski carpet pattern (SCP) on metallic and superconducting NbN films. Multiple extraordinary terahertz (THz) transmission peaks are studied in the transmission spectra using both THz time-domain spectroscopy and numerical simulation. The characteristic transmission peaks are found to be associated with the interaction of surface plasmon polaritons (SPPs) and localized surface plasmons (LSPs) for ring-shaped apertures. The effect of LSPs is less remarkable in the square apertures. For the superconducting NbN film, when the temperature is slightly lower than the critical transition temperature T_c, the peak magnitude of SPP resonances is most prominent due to the non-monotonic temperature dependence of kinetic inductance. These results provide a new way to design compact and efficient THz devices.
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Inspec controlled terms:fractals - niobium compounds - polaritons - superconducting thin films - superconducting transition temperature - surface plasmons
Uncontrolled terms:fractal-featured metallic films - superconducting films - terahertz frequency - fractal-featured square apertures - ring-shaped apertures - Sierpinski carpet pattern - extraordinary terahertz transmission peaks - transmission spectra - THz time-domain spectroscopy - numerical simulation - characteristic transmission peaks - surface plasmon polaritons - localized surface plasmons - critical transition temperature - SPP resonances –