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标题: Picosecond fiber laser microfabrication of THz wire-grid polarizers on polymer membrane substrates
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摘要: Ultrafast picosecond lasers provide the gentle cold ablation required to selectively remove a 400 nm metal film from an unsupported ultra-thin polymer membrane without damaging the membrane substrate. Selected areas of the metal film are completely removed in an ablative lift-off process enabled by a single laser pulse. No damage to the polymer membrane is observed even for samples with the metal completely removed over a 50x50 mm area of the membrane. The 400 nm thick metal films can be patterned into arbitrary forms with feature sizes as small as 10 micrometers, and even submicron features are realistically possible with a modification to the processing system. The skin depth of aluminium in the THz regime is significantly shorter than the 400 nm metal thickness, so thicker metal films that are significantly more difficult to machine are not beneficial. As an example, thin-film wire grid polarizers for the THz regime are demonstrated. The thin-film polarizers are much easier and faster to fabricate than polarizers made by winding free-standing wires around a frame and their performance is very comparable. The thin-film polarizers also have the added benefit of a significantly higher potential for functionality deeper in to the THz spectrum due to their capacity for smaller feature sizes. More intricate patterns, such as meshes, can also be made to create THz bandpass filters. This method can be extended to cold ablation processing of multilayer films fabricated on thin polymer substrates for applications such as plastic electronics, displays and solar cells.
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