



TECHNOLOGY

Method for Patterning by Electron Beam Lithography on Insulating Substrates

OVERVIEW

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Executive summary

Background:

Electron beam lithography (EBL) is a powerful tool for nanoscale fabrication, but its applicability to insulating substrates is often limited. For example, EBL does not work well on borosilicate glass substrates but can be performed on ITO-coated glass, where ITO is indium tin oxide, a transparent conductor. It is desirable to create patterns by EBL on insulating substrates, for example on glass and other transparent materials suitable for optical components, however very few transparent materials conduct electricity. One solution is to coat the substrate with ITO or another conducting oxide, however indium is a rare element and conducting oxides have limitations regarding chemical and biological compatibility, therefore this solution is not always practical. Another solution is to place a conducting polymer between substrate and resist which proves to be costly.

Innovation:

Researchers at the University of Maryland have developed a novel method for patterning by electron beam lithography on insulating substrates. It is particularly suitable for applications that require optical transparency in the substrate and biocompatibility. The method has been demonstrated in the preparation of gold and aluminum patterns over glass or silicon substrates, and should be compatible with all insulating substrates that can tolerate moderately elevated temperature and diluted acids. Patterning metal nanostructures on insulating substrates can be a practical way to place electrodes or photonic crystals on the substrates. Furthermore the method can be used to pattern one insulating material over another, for example, to spatially control and engineer the dielectric constant of the substrate. The structures were as small as 80nm.

APPLICATIONS

Fabrication of diffraction elements

Fabrication of metamaterials

Microfluidics

ADVANTAGES

Indium Free

High Resolution patterning

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Additional Information

INSTITUTION

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PATENT STATUS

Pending

EXTERNAL RESOURCES

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