附件四、技術說明表

透過米氏共振及材料相變達成百分之一波長解析度的微影

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簡　歷：
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市場及需求:
高解析度晶片製造、高解析度微影

技術摘要(含成果):
晶片已成為現今生活中不可或缺的核心元件，廣泛應用於各類電子產品中。為了提升運算速度並縮小體積，半導體製造商普遍採用高解析度微影技術，例如極紫外光微影與電子束微影。然而，這些技術不僅成本高昂，其最小特徵尺寸往往僅能比光源波長縮小不到十倍，顯示出明顯的技術瓶頸。

本專利提出以可見光雷射激發半導體的米氏共振，並結合相變效應，實現比波長小一百倍的特徵長度，突破傳統微影技術的限制。

優勢:
1. **超高解析度：**特徵長度可縮小至波長的百分之一。
2. **低成本：**本系統價格相對現今常用的極紫外光刻機、電子束光刻機便宜許多，降低整體製程成本。
3. **非真空環境操作：**不需在真空條件下進行微影，大幅簡化製程。
4. **三維可調控性：**可調整加工位置，支援複雜結構的三維微影。
5. **免光罩及光阻製程：**不需使用光罩與光阻即可進行微影。

競爭產品:
紫外光刻機、電子束光刻機
專利現況:

聯絡方式(請不用填):
臺大產學合作總中心
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λ/100 resolution in lithography based on Mie-assisted phase change

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Experience:
Web page: https://sites.google.com/site/ntubiooptic/home

Market Needs:
High-resolution fabrication of integrated circuits, high-resolution lithography

Our Technology:
Integrated circuits, or chips, are indispensable in modern life, powering virtually every electronic device. Achieving higher computation speeds and smaller device sizes relies on high-resolution lithography, which is central to chip fabrication. Currently, the predominant techniques are extreme ultraviolet lithography (EUVL) and electron-beam lithography (EBL). While capable of high resolution, these approaches typically produce features only up to one order of magnitude smaller than the operating wavelength, revealing a fundamental limitation. This patent introduces a novel method that leverages Mie resonances in semiconductors, combined with phase-change effects, to achieve feature sizes up to two orders of magnitude smaller than the operating wavelength—overcoming the constraints of conventional lithography.

Strength:
1. **High resolution:** feature sizes are two orders of magnitude smaller than the operating wavelength.
2. **Low costs:** the system is significantly less expensive than EUVL and EBL machines.
3. **Operation in ambient conditions:** no vacuum environment is required.
4. **Three-dimensional fabrication:** the method allows control for true 3D fabrication.
5. **Maskless and photoresist-free process:** lithography can be carried out without requiring physical masks and photoresist materials.

Competing Products:
EUVL machines, EBL machines

Intellectual Properties:

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