

**Docket #:** S11-473A

# Printing Lens

Stanford researchers have developed a method for manufacturing a UV curable epoxy micro lens. Apertures of arbitrary size can be manufactured for micro lenses using this method. This micro lens is particularly useful in microscopes having a shorter optical path length over conventional optical microscopes.



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(12) **United States Patent**  
**Prakash et al.**

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(54) **OPTICAL LENS FABRICATION**  
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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 154 days.

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**G02B 3/00** (2006.01)  
**G02B 9/00** (2006.01)  
(Continued)

(52) **U.S. CL.**  
CPC ..... **G02B 21/02** (2013.01); **B29D 11/00365** (2013.01); **B29D 11/00432** (2013.01);  
(Continued)

(58) **Field of Classification Search**  
CPC ..... G02B 21/02; G02B 3/0087; G02B 5/005; G02B 21/0008; G02B 3/00; B29D 11/00432; B29D 11/00365  
See application file for complete search history.

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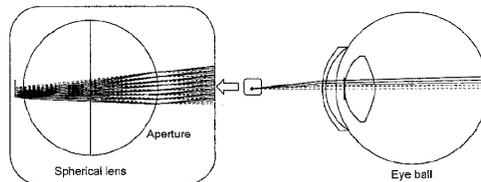
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(57) **ABSTRACT**

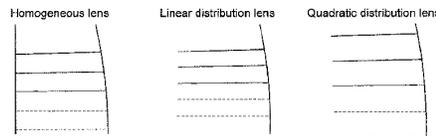
Optical lenses and methods for manufacturing optical lenses are disclosed herein. Lenses having a reduced aperture size are also disclosed herein along with methods for making the same. The optical lenses disclosed herein can be made having improved optical properties. The lenses can be used in optical microscopes, including optical microscopes with a shorter optical path relative to conventional optical microscopes.

**20 Claims, 17 Drawing Sheets**

Ray tracing plots for different spherical lenses



Comparison of the three different lenses



GRIN lens with quadratic profile is preferable for reducing the spherical aberration.

## Patents

- Published Application: [WO2014022652](#)
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