



# Innovative Ceramic Etching Technique

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## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,535,192	01/03/2017	2014-174

## FULL DESCRIPTION

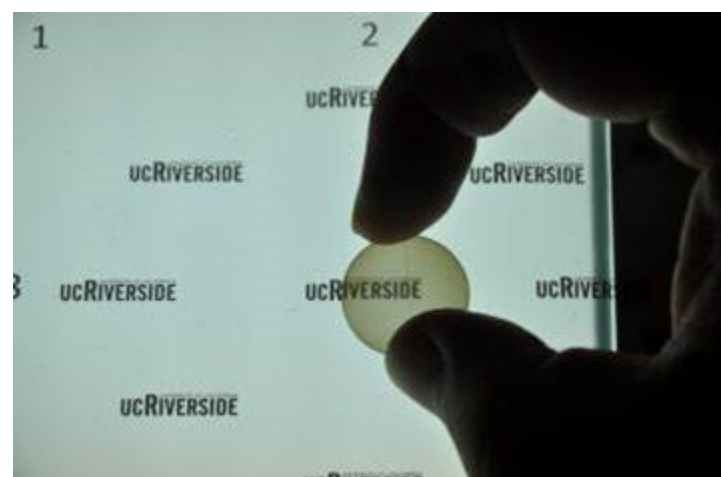
### Background

Waveguides in optical media are an essential part of a wide variety of important optical devices. Ceramics offer high temperature and chemical stability and relatively efficient fabrication compared to glasses and single crystals thus promising to increase the application space for optical materials. These advantages have prompted investigations and various successful demonstrations of waveguide written in ceramics. A potential drawback to the widespread application of waveguide structures in ceramic-based devices is the relatively high power that is necessary to induce permanent optical changes in ceramics i.e., for waveguide writing.

### Technology

The invention is a method for writing waveguides in transparent polycrystalline ceramics using femtosecond laser pulses with remarkably low energy of 5nJ. The energy used for writing these waveguide-like structures is at least three or four orders of magnitude lower than earlier reported for ceramics. The inventors have demonstrated the use of this technique in writing waveguide like structures in optically transparent Ytria Stabilized Zirconia (YSZ) ceramics.

The low energy requirements for writing waveguides should make these optical ceramics more cooperative, efficient, and economical to industrial applications and their integration in devices.



Transparent Ytria Stabilized Zirconia

## OTHER INFORMATION

### KEYWORDS

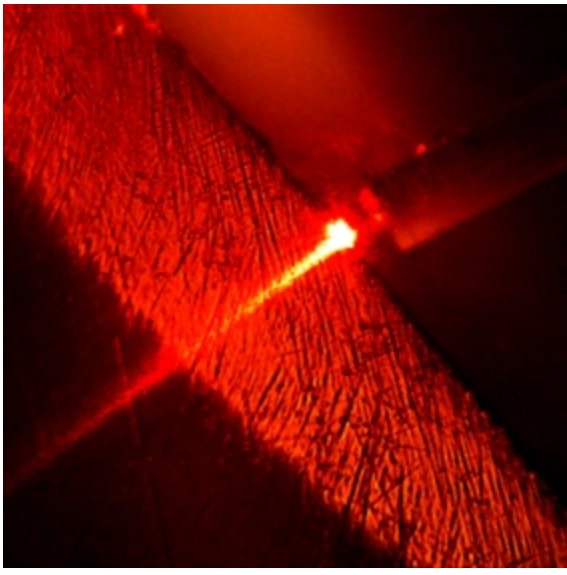
ceramics, yttria stabilized ceramics, waveguides, optics, biomedical implants, polycrystalline ceramics, low energy, optical materials

### CATEGORIZED AS

- ▶ **Optics and Photonics**
  - ▶ All Optics and Photonics
- ▶ **Engineering**
  - ▶ Engineering
- ▶ **Imaging**
  - ▶ Medical
- ▶ **Materials & Chemicals**
  - ▶ Ceramics
- ▶ **Medical**
  - ▶ Devices
  - ▶ Diagnostics
  - ▶ Research Tools

### RELATED CASES

2014-174-0



Light confinement in a waveguide like structure

## BENEFITS

- ▶ Lowest energy for the successful writing of waveguide like structures in a ceramic material
- ▶ Low temperature process
- ▶ Chemical stability
- ▶ Efficient fabrication.

## APPLICATIONS

- ▶  
Optical materials
- ▶  
Biomedical implants

## RELATED MATERIALS

- ▶ [Waveguide-like structures written in transparent polycrystalline ceramics with an ultra-low fluence femtosecond laser](#)

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