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Highly Rare Earth Doped Optical Fiber & Heating Element Comprising Same (2018-022)

An optical fiber doped with light absorbing species that heats up substantially under illumination for biomedical and microfluidic applications.

Market Overview

This highly rare earth doped optical fiber and heating element is superior to traditional methods, allow for the absorption of light for biomedical and microfluidic applications. According to Allied Market Research, the global optical fiber market was valued at $3,477 million in 2017, and is projected to reach $8,153 million by 2025, growing at a CAGR of 11.6% from 2018 to 2025. When Ytterbium (Yb) is doped into glass, it can absorb light and then reradiate it, forming the basis for a laser gain medium. With conventional methods, however, there is a limit to how much Yb can be doped into silica. Clemson University and University of Illinois researchers have developed a new method to overcome these limitations with a novel optical fiber doped with light absorbing species that heats up sustantially under illumination.

Technical Summary

This technology features a Yb metal wire, which is inserted into a preform and drawn into a fiber. The Yb oxidizes and results in rare earth concentrations that cannot be achieved using conventional methods. When the Yb concentration reaches a critical level, Yb no longer radiates light, allowing for the optical pumping power to be efficiently converted to thermal energy. In a highly doped fiber, this thermal energy is then placed into a volume rod, which forms the basis for a highly efficient microheating element. This technology has an array of potential biomedical and microfluidic applications, including hand-held, portable microheaters and a micro-cauterizing tool, both critical to the field of precision surgery.

Application

Optical Fiber, Biomedical, Microheater, Microfluidity, Ytterbium (Yb) Doped Fiber, Rare Earth Doped Fibers

Development Stage

Prototype

Advantages

- Yb is doped into glass rather than silica, allowing for safer, more efficient light radiation
- Can be integrated into existing laser pointers
- Hand held microheaters for medical applications among others still to be determined

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
N/A	United States	N/A	N/A	2018-022	Dr. John Ballato

About the Inventors

Dr. John Ballato

Professor of Materials Science and Engineering at Clemson University

Dr. John Ballato received his Ph.D. in Ceramic and Materials Engineering from Rutgers University in 1997. Along with being a professor, Dr. Ballato is the director of COMSET, the South Carolina Research Center of Economic Excellence. He has published more than 200 scientific papers, holds 25 U.S. patents and foreign patents, and has given in excess of 125 invited lectures. His research interests include new optical materials and structures for high-value photonic and optoelectronic applications.

For more information on this technology contact:

A. Chris Gesswein
Director of Licensing for Technology Transfer
E: agesswe@clemson.edu
P: (864) 656-0797