University of Central Florida

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High Power Mirror for Laser Filamentation

Laser filamentation is the nonlinear optical phenomenon of self-focusing and propagation of a laser beam, which is often employed to deliver high-peak-power laser radiation at remote distances. But laser filamentation requires a pulse of high peak power that exceeds the damage threshold of conventional laser mirrors. Now, UCF researchers have created a high-power laser mirror able to endure the peak power levels required for laser filamentation, withstanding high energy densities, in the range of 0.5 to 1.5 J/cm2, while remaining simple to manufacture. In addition to laser filamentation, the mirror can be used to redirect other types of high-power laser beams.

Technical Details

The new mirror can surpass the damage threshold of conventional mirrors because of its composition, a 500nm-thick layer of high-purity gold deposited on a smooth sapphire substrate. Gold, among other noble metals, shows a beneficially slow decay in electron temperature, allowing hot electrons to pass further into the material and reducing temperature difference between the front and back surface, so that energy delivered per unit area does not exceed the material damage threshold. Gold's high electron mobility and intrinsic reflectivity in the infrared can be employed with comparable metals including, for example, copper, silver, and their alloys or an alloy of gold. Additional layers can improve the laser's performance, like chromium for an adhesive layer and more gold for an oxidation-inhibiting layer. The mirror can be fabricated through physical vapor deposition, including evaporative and sputtering methods, and chemical vapor deposition methods.

UCF Inventors

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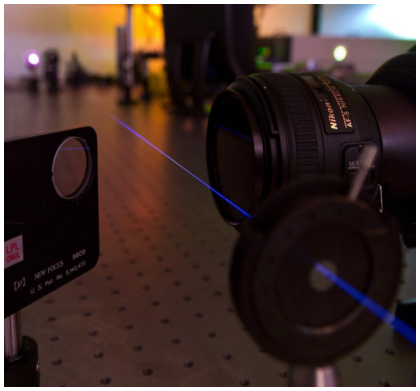
***Photo Caption**

A long-exposure photograph of the plasma emission that results during filamentation. Within a dark laboratory, the filament emission was visible to the dark adapted eye—detection primarily by the rods of the human eye and not the cones. The blue color was characteristic of molecular nitrogen emission bands in the 300 nm to 400 nm spectral region.

Photo Credit

http://lpl.creol.ucf.edu/images/research/researchFilamentation.jpg



**See photo credit and caption below*

Benefits

- Withstands high power densities required for laser filamentation

Applications

- Laser filamentation

Tech Fields

Optics & Lasers

Keywords

laser filamentation, nonlinear optics, mirror, reflective component

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If you or your company are interested in this opportunity, Contact:

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