

The CUNY Center for Advanced Technology In Photonics Applications (CUNY CAT)  
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## Cr<sup>4+</sup>-Doped Optical Fiber Amplifier

*A large gain bandwidth (> 200 nm) for near-infrared light signals*

Cr<sup>4+</sup>-doped dielectric fiber amplifiers are expected to amplify laser light in the spectral region from 1.1 to 1.7 μm. This spectral range includes two key wavelengths centered at 1.3 μm and 1.55 μm currently used in fiber optical communication systems.

### Applications:

- Optical communications
- Telecommunications

### Benefits:

- Inexpensive
- Large gain bandwidth (> 200 nm)
- Multiple near infrared central wavelengths
- High gain

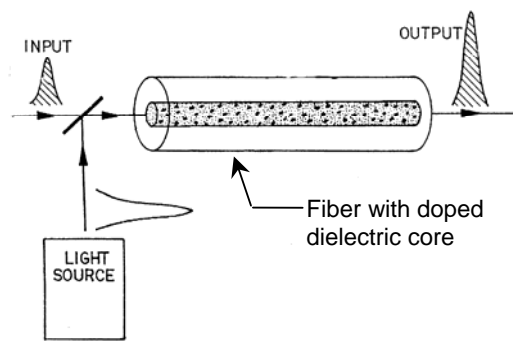


Figure 1. Cr<sup>4+</sup>-Doped Optical Fiber Amplifier

### The Technology

Current optical fiber amplifier technology is based on erbium (Er) and praseodymium (Pr)-doped fibers with gain bandwidth of ~ 20 nm. Newer experimental versions at Lucent Technologies and NTT have achieved 80 nm bandwidth for erbium systems. The proposed fiber amplifier shown in Figure 1 consists of a Cr<sup>4+</sup>-doped optical fiber amplifying medium and a light source capable of pumping the fiber in such a way as to excite chromium ions. The gain bandwidth of Cr<sup>4+</sup>-based laser systems is larger than 200 nm. The amplifying medium of the fiber comprises a plurality of Cr<sup>4+</sup>-doped crystalline particles capable of lasing at 1.3 μm and/or 1.55 μm, and having diameters of approximately 0.05 μm to 500 μm. Crystalline particles are dispersed within a medium which has an index of refraction which matches that of the crystalline particles. The fiber can be pumped by a fiber laser, a Nd:YAG solid-state laser, or a semiconductor laser.

This technology opportunity sheet describes continuing efforts in this area. Several patents may have been issued or are pending and which may be available for licensing.

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