NASA SBIR Technologies
The Affordable Pre-Finishing of CVD for Optical Applications
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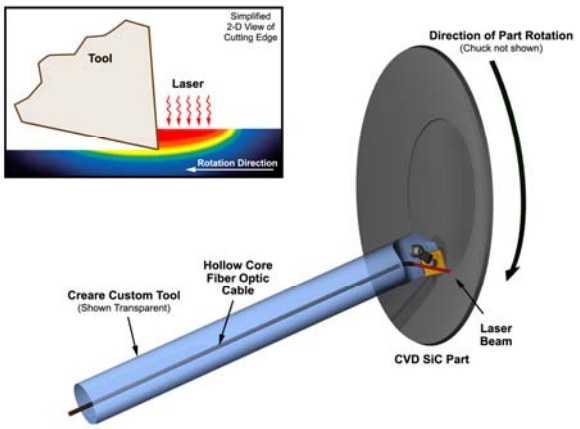
Identification and Significance of Innovation

- **Lightweight optical technologies are critical for the future of missions to explore our solar system**
- **CVD silicon carbide has been shown to be a viable alternative for lightweight optics and mirrors**
- **Cost-effective methodologies to produce high quality pre-finished optics have not been developed**
- **Current processes are either slow and costly, or they induce significant sub-surface damage**
- **Our innovation is a laser-assisted, ultra-precision pre-finishing process that will produce high quality, accurate surfaces that are free of sub-surface damage**
- **The net result is lower cost compared to other pre-finishing processes (grinding, ductile-regime machining, RAP, laser micromachining) and a higher quality surface prepared for final optical finishing**

TRL Range: 3 to 5



The Creare Laser-Assisted, Ultra-Precision Pre-Finishing Approach. Our innovation uses continuous-wave, far-infrared laser of low power (<20 W) to preheat a thin layer of the CVD silicon carbide material prior to its removal using a single-point tool. By heating a very thin layer of material near the surface, the laser enables plastic flow with a minimum of bulk heating. Using our innovation, the material removal rate (MRR) can be increased approximately two orders of magnitude for the rapid, high-quality pre-finishing of aspheric optics prior to optical finishing.

Technical Objectives

Demonstrate the Advantages
Determine the Cost Savings
Outline the Transition Plan

Work Plan

Design Process
Demonstrate Machining Approach
Evaluate Cost Savings

NASA Applications

Lightweight optics
Long-range telescopes

Non-NASA Applications

Commercial aircraft
Artificial joints
Cutting tools
Automotive applications

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