Revolutionizing Engineering through Visible Light: The Safe and Cost-Effective Creation of Ultra-Light, Strong, and Easily Architectured Materials

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Can you imagine a world in which all we need to quickly create complex structures is an LED lamp and a short set of parameters to follow? This study focused on the creation of micro-scale structures through the use of blue visible light and photo-polymerization. By allowing angled collimated light to propagate through an ordered mask and then through a photopolymer, individual and interconnected channels were created through cross-linking of monomer in the path of the light beams. The use of visible light lamps afforded the possibility of liberal design and architecture of the individual channels. With this possibility, complex, interconnected networks of fibers were quickly created all at the same time as cellular materials, and more specifically, micro-trusses, which due to their structure and porosity, are very lightweight and yet maintain their strength and stiffness. In fact, this is the first time in the world that such architectured materials have been created using visible light, which opens a remarkable amount of possibilities. These architected cellular materials can then be coated with a wide range of materials and burned, and thus be turned into ultra light metals and ceramics for use throughout the world! The use of visible light to create these structures opens the door for widespread manufacture of such remarkable, architectured materials as light can be shone over wide areas because blue LED lamps are much safer and much cheaper relative to current UV lamp fabrication methods in laboratories, which require massive safety precautions and specialty devices, and must then be limited to compact areas.

Awards Won:

National Aeronautics and Space Administration: Honorable Mention