Joule Heating and Carbon Fibers (#6543)

A process for stabilizing carbon composite fibers that is more energy efficient

Georgia Tech inventors have developed a process to locally heat fibers without heating the surroundings. These fibers are produced from a composite of polyacrylonitrile (PAN) and carbon nanotubes (CNT). This process utilizes the conductive properties of the CNT portion of the composite fibers by directly applying an electrical current to the composite fiber itself, and thus allowing the fibers to be stabilized in air. This allows for significant energy savings compared to current stabilization processes because energy is not wasted on heating the surroundings.

Additionally, this process can be applied to a variety of materials containing carbon nanotubes and graphene, resulting in many options for the composition of the copolymer.

Benefits/Advantages

- **Energy Efficient –** Heat is applied locally rather than to the fibers and the surroundings
- **Conductive Carbon Fibers –** Due to the inclusion of CNT materials
- **Versatile –** Many carbon materials can be stabilized using this process
- **Cheaper –** Energy is not wasted
- **Faster –** Locally applying heat results in a faster stabilization process

Potential Commercial Applications

- Electronics and Electromagnetic devices
- Energy Storage
- Automobile and vehicle manufacturing
- Sporting goods

Background/Context for This Invention

Carbon composite materials are highly sought for their light weight and superb mechanical properties. Current manufacturing processes to make carbon composite fibers tend to be extremely energy intensive. Fibers must be stabilized by heating them in a furnace. A significant amount of energy is wasted in this process, and thus, there is a need for a process that is more energy efficient.

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More Information

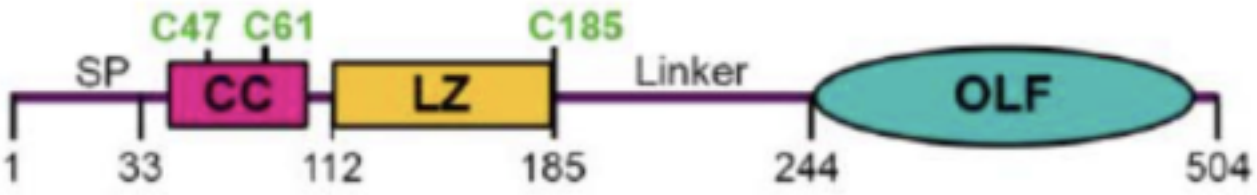
U.S. Patent Issued - 9409337

Publications

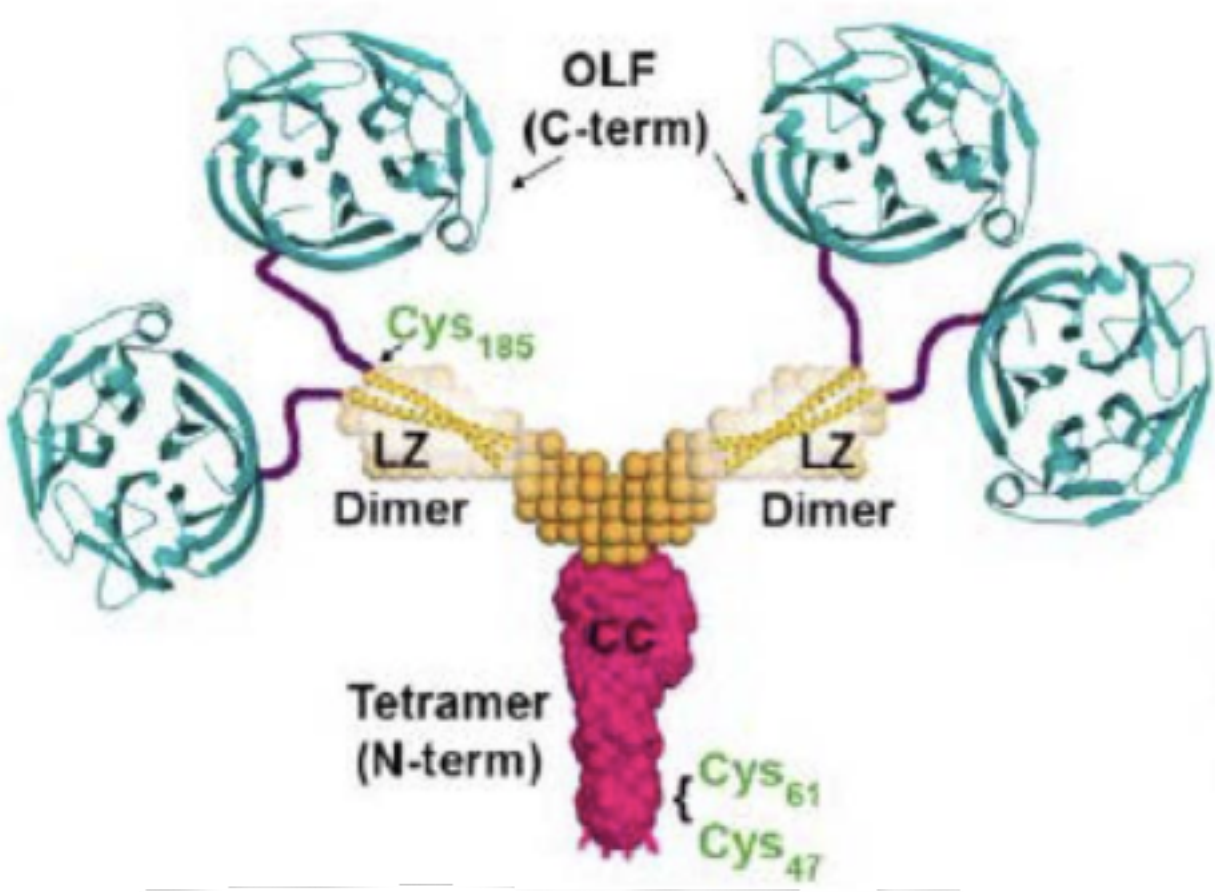
High strength and high modulus carbon fibers, ScienceDirect

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/joule-heating-and-carbon-fibers

Images:



The gene structure depicting the domains of myocilin, including signal peptide, location of key cysteine residues, and its coiled-coil, leucine zipper, and olfactomedin domains.



The myocilin quaternary structure based on solution X-ray scattering, X-ray crystallography, and chemical cross-linking experiments.