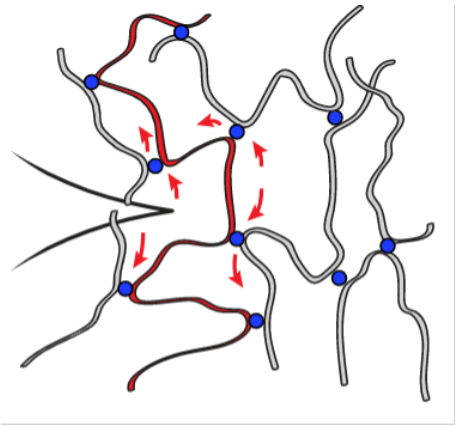

A method to increase the durability and lifespan of commercially available soft polymer networks

Unmet Need

Soft polymers are used for a variety of products including biomedical implants, footwear, and tires. Having a more durable polymer product will increase not only the lifespan of the product but also the safety of some major products such as automobile tires, where it is estimated that some 11,000 accidents in the US are caused by bad tires. There is a need for polymer networks in structural applications that withstand better the degradative forces which they are exposed to resulting in fewer micro-cracks in the polymer leading to a longer lifespan of the product.

Technology

Duke inventors have developed a method to increase the durability and lifespan of soft polymer networks. This is intended to be introduced during the synthesis of existing materials used for biomedical implants, tires, and other applications. This invention can also enable the creation of new soft polymer networks with novel applications. Specifically, a mechanochemically weak crosslinker is introduced into a soft polymer network of long primary chains that are mechanochemically strong. This mix of weak and strong components allows the load to be redistributed in a way that maintains the integrity of the primary polymer network. This technology has been demonstrated to increase the toughness of a polyacrylate elastomer network up to 9 times compared to using a control crosslinker.

Advantages

- Method that can increase durability and lifespan of soft polymer networks up to 9x
- Can be incorporated into polymer formulations of existing products to improve longevity
- Does not add substantial bulk to the product due to the covalent nature of the cross-linker

Duke File (IDF) Number

IDF #:T-007855

Meet the Inventors

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Chemistry

External Link(s)

- From the lab of Stephen Craig
- NSF Creates Polymer Chemistry Optimization Center at Duke for Future Materials (Duke Today, 2021)