New study shows nickel graphene can be tuned for optimal fracture strength

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In a new computational study published in the *Journal of The Minerals, Metals & Materials Society*, University of Arkansas engineering researchers found that nanocomposites composed of layers of nickel and graphene—a promising new material for flexible electronics devices—can be tuned for optimal fracture strength by manipulating the structural arrangement of the graphene sheets.

The study was conducted by Scott Muller, mechanical engineering graduate student, and Arun Nair, assistant professor of mechanical engineering.

Discovered in 2004, graphene is one of the strongest, lightest and most conductive materials known. It is 100 times stronger than steel. When incorporated in to a metal matrix, these properties can lead to stronger and yet lighter materials, such as those used on automobiles.

When combined with a metal such as nickel, graphene's superior mechanical properties make it an excellent candidate for a nanocomposite fiber material to be used in flexible electronic devices and other technologies. Nickel is often used in metal-graphene nanocomposite research because graphene sticks strongly to its surface.

Muller and Nair simulated a graphene sheet embedded within a nickel matrix. A crack was built into the nickel matrix, and then they tested different distances between the graphene and the crack. When the distance between the graphene and the crack was large, the nanocomposite proved more resistant to deformation. They also found that graphene acted as an effective barrier to deformations in the metal, ensuring that failure in one part of the metal would not carry over past the graphene sheet.

Provided by University of Arkansas