

Researchers seek high-pressure materials without high-pressure processes

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Military missions place tremendous stress on the materials used for defense weapons, vehicles and other applications. As a result, the search for stronger, lighter and more resilient materials is never ending. Some materials have proven to have high pressure phases that could yield performance improvements in a variety of defense applications provided the processes could be scaled to create stable materials in the quantities needed for the defense mission. Applications range from stronger armor, to lighter weights which allow for faster propulsion, to greater resiliency in aerospace, ground and naval platforms.

The Defense Advanced Research Projects Agency's (DARPA's) Extended Solids program seeks to identify processes that enable stabilization and production of high pressure phase [materials](#), without the limitations of scale introduced by current high-pressure processes, that exhibit properties far superior to those currently available for DoD applications.

"We seek the ability to access these ultrahigh pressure phases without having to use the ultrahigh pressures currently required to achieve them," said Judah Goldwasser, DARPA's program manager for this effort. "In the thermochemical world, the ability to synthesize the vast array of materials available both biochemically and synthetically is predicated on exploitation of multistep synthesis and stabilization strategies, so target materials can be produced through intermediates using methods and conditions mild enough to be viable."

Through this program, DARPA seeks the development of analogous strategies that can be applied to the barochemistry, or ultrahigh pressure regime. This technology could fundamentally change the way high-pressure polymorphs/phases are synthesized, potentially opening a vast new material design space for exploitation.

Goldwasser stressed that the complex nature of this research effort requires diverse sets of skills and expertise to meet program objectives and milestones, and encouraged potential researchers to team with others to help ensure success.

Provided by Defense Advanced Research Projects Agency

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