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Condensed Matter System with Ideal Diamagnetic Response at Room Temperature

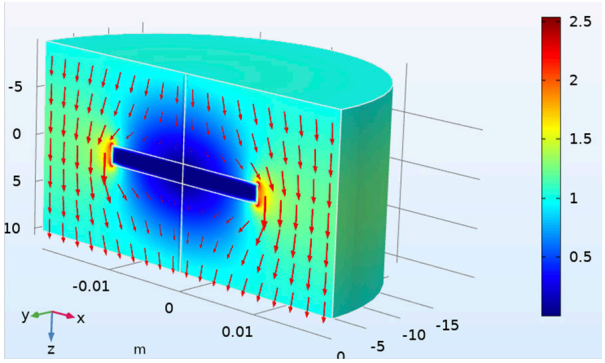
Chapman Case #2020-006

Market Need

Superconductors have many industrial and commercial applications from offering magnetic levitation for bullet trains, to enabling superconducting quantum computing. In the past, superconductivity was achieved only when certain metals or alloys were cooled to extremely low temperatures (at least below -148°C). Recent scientific advances have demonstrated superconductivity at higher temperatures, in the range of -23°C to -13°C; and most recently, superconductivity was reported to occur up to higher extreme, 277°C, far above room temperature (25°C) and at 2 million times atmospheric pressure. To create an environment that enables superconductivity, conditioning must be present to reach and maintain these extreme pressures, thus constraining the applications of these superconductors. To remove this pressure limitation, there is a need for a substance that can achieve superconductivity at ambient conditions.

Chapman Solution

Dr. Armen Gulian of Chapman University's Institute for Quantum Studies and Advanced Physics Laboratory and his colleagues had invented a system that exhibited ideal diamagnetism (a necessary property of a superconductor) at room temperature. The system was comprised of a graphene layer with a thin permalloy foil parallel to the graphene layer, with both of them immersed in a n-heptane solution at room temperature. The system exhibited ideal diamagnetism when an external DC electromagnetic field was applied to it; this observation had demonstrated the possibility of this system being a candidate for room-temperature superconductor at ambient conditions.



Applications

- Faster computers
- A new way for storing data
- Room-temperature quantum computers that are significantly more energy efficient

Key Publication

- Ideal diamagnetic response at room temperature by graphene-*n*-heptane-permalloy system, Modern Physics Letters B, World Scientific, July 2, 2020.

Intellectual Property

- Provisional patent filed: 62/992,391

Stage of Development

- Reproducible observations of ideal diamagnetism demonstrated by the proposed system at room temperature
- Available for licensing and further research collaborations

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