Nonconductive graphene-based plastics for total sub-terahertz radiation shielding

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Increasing the requirements on telecommunications systems such as the need for higher data rates and connectivity via the Internet of things results in continuously increasing amounts of electromagnetic radiation in ever-higher telecommunications bands (up to terahertz). This can generate unwanted electromagnetic radiation that can affect the operation of electronic devices and human health. Here, we demonstrate that nonconductive and lightweight, graphene-based composites can shield more than 99.99% of the electromagnetic energy in the sub-THz range mainly via absorption [1]. This contrasts with state-of-the-art electromagnetic radiation shielding materials that simply redirect the energy of the radiation from a protected area via conduction-based reflection mechanisms. This shifts the problem of electromagnetic pollution from one place to another. We have demonstrated that the proposed composites can be fabricated by industrial compatible methods and are characterized by specific shielding efficiency values that exceed 50 dB•cm3/g, which is more than those for typical metals used today. Therefore these materials might help to solve the problem of electromagnetic environmental pollution.

Figures

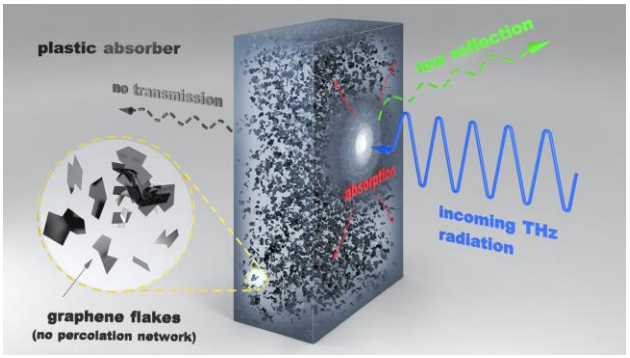

Figure 1: Proposed mechanisms of interaction of THz wave with graphene based composite

References

[1] M. Zdrojek, J. Bomba, A. Łapińska, A. Dużyńska, K. Żerańska, J. Suszek, L. Stobiński, A. Taube , M. Sypek, J. Judek, Scientific Reports, accepted (2018)