



# High Performance Hybrid Nanocomposite Materials

## Researcher

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## Research

Innovative nanocomposite materials, based on loading epoxy polymer with hybrid nano-fillers: the first nano-filler is the newly discovered graphene, and the second is carbon nano-tubes, already applied in automotive parts and large-area coating due to its extraordinary strength. Prof. Regev's lab harnesses nano-fillers' novel properties for the purpose of manufacturing a lightweight, strong and resilient material that will provide reinforcement in a number of key mechanical challenges for structural adhesives (used to adhere key elements in complex structures), or serve as traditional composite materials elements.

The uniqueness and innovativeness of this technology is the integration of two types of nano-fillers, which differ in morphology and properties. By using hybrid filling, we harness both nano-fillers' morphologies in producing a positive synergetic nanocomposite, i.e., yielding better performance (Fracture toughness  $2.5 \text{ MPa}\cdot\text{m}^{0.5}$  and flexural strength of 120 MPa) than a composite with a single nano-filler. We postulate that the combination of two types of nano-nanofillers will form a highly compact 3D network, providing a more effective means for stress transfers and hence, reinforcement.

## Applications & Products

- Applicative and simple technology for employing nano-fillers in composite materials and polymer industries.
- Strong and lightweight composite materials.

## Market Potential

The US demand for adhesives and sealants for 2017 is anticipated to be about 9.8 billion pounds, valued at over \$11 billion. The composite materials–aerospace market is anticipated to grow to 46,175 metric tons, valued at \$4.5 billion by 2022.

The field of nano-fillers is a rapidly growing market. The production of nanotubes had grown by over 450% percent between 2008 and 2011, with price dropping below \$1/g, which increases its attractiveness and business feasibility.