Application of Graphene Oxide with Energetic Materials

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The development of next generation energetic materials (EMs) that are insensitive, highly thermostable and high performing is extremely important and in high demand by both civil and defence industries. This is driven by the increased emphasis on safety and reducing risks associated with transporting, manufacturing and storing of high explosives.

For a large majority of EMs, their limitations are related to a trade-off between energy and sensitivity (thermal, impact, and friction). An ideal EM would possess high energy and low sensitivity, however, existing EMs are either high energy with high sensitivity or low energy with low sensitivity.

One technique to overcome this hurdle is the addition of nanoadditives like graphene oxide (GO). GO is a single-atom layer material of graphite oxide that has been exfoliated from the bulk material to contain various oxygen-based functional groups on its basal plane and edges. GO has been shown to desensitise and stabilise highly sensitive EMs while being an EM itself which highlights its multifunctional capabilities.

The concept of designing novel compositions with the addition of GO provides an architectural platform for developing next generation EMs through the exploitation of GO's multifunctional properties. This presentation will show case new GO composites and their performance properties. The study of GO on a molecular level using molecular dynamics simulations will also be explored. This will focus on the interactions of EMs with GO sheets to elucidate molecular structures, and the mechanism which allows GO to desensitise and thermally stabilise an EM while preserving its energetic properties.

Biography

Kay Chen is currently an honours student in Debra Bernhardt and Joe Shapter's group at The University of Queensland (UQ). Her honours project is in collaboration with the Defence Science & Technology Group with Arthur Provatas as her supervisor. In 2018 she obtained her BSc/BA majoring in chemistry and international relations at UQ.

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