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Date: November 18, 2015
Time: 11:30am
Location: Advanced Energy Center, Rm 104

"Peroxide-rich coatings for lithium and sodium ion battery anodes"

By
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Three properties of hydrogen peroxide are responsible for much of its contemporary popularity (over three million metric tonnes are produced annually), it is environmentally friendly oxidant; it is (relatively) stable, and its activity can be regulated, *i.e.* activated or neutralized by peroxidase and catalase mimics.

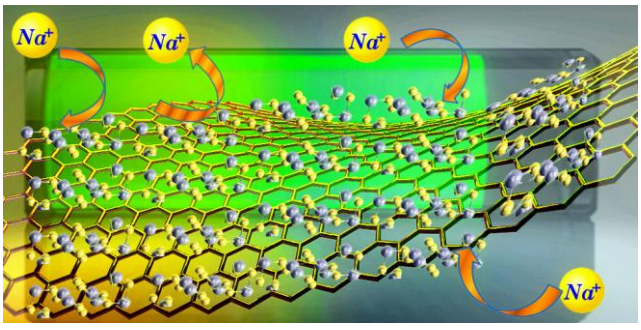
Hydrogen peroxide is usually marketed as aqueous phase, and when it is packaged in a solid form it rapidly discharge its peroxide content to the aqueous phase. It is still difficult to envisage peroxide-rich nanoparticles that can store H_2O_2 in aqueous dispersions and discharge active oxygen species on demand. We have recently introduced different forms of peroxide-rich materials that have unique properties: e.g. edible forms, stable formulations that retain hydrogen peroxide content under near-neutral aqueous conditions, and hydrogen peroxide nanoparticle capping agents, that can be easily removed by mild treatments.

I shall describe a methodology for stabilization of peroxide capped nanoparticles, coating of graphene oxide by peroxocomplexes of post-transition elements and their transformations to the zero-valent post-transition elements, their oxides, and sulfides. Several post-transition elements, such as antimony, germanium, tellurium and tin alloy with lithium or sodium at rather low potentials which make them good candidates for lithium and sodium - ion battery anodes. For that it is desirable to coat GO with ultra-thin films of the oxides, zero-valent elements and sulfides. We have demonstrated that it is possible to coat GO by nanofilms of peroxocompounds of different p-block elements. Then, heat treatment can be used to produce the respective oxide nanoparticles, which can then be further converted to the oxides and/or to their respective elements by reaction with the graphene supports. Sulfurization of the peroxocompounds followed by heat treatment can be used to convet the materials to the respective sulfides.

The synthesis of efficient lithium and sodium ion battery anodes is described and I shall further demonstrate a route for waste-free, low temperature processing of lithium and sodium ion battery anodes.

REFERENCES

Nature Communications, 4, 2922, 2013; Prikhodchenko, PV, et al., **J of Materials Chemistry A**, 2 8431, 2014; Wolanov, Y, et al., **Dalton Transactions**, 43, 1661, 2014; Medvedev, et al., Inorganic Chemistry, 54, 8058, 2015; Medvedev A et al., **Mater. Chem. A**, 2015, I press, DOI: 10.1039/C5TA 04514B



"Brief lunch will be provided during the talk"

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