

Engineering Conferences International ECI Digital Archives

Composites at Lake Louise (CALL 2015)

Proceedings

Fall 11-11-2015

Bio-inspired hybrid nanocomposites in single crystalline hosts: From structure to function

Boaz Pokroy

Technion Israel Institute of Technology, bpokroy@tx.technion.ac.il

Follow this and additional works at: http://dc.engconfintl.org/composites_all

 Part of the [Materials Science and Engineering Commons](#)

Recommended Citation

1. Pokroy B., Caspi E. N., Quintana J. P., Berner A. and Zolotoyabko E. "Anisotropic lattice distortions in biogenic aragonite". *Nature Materials*, 4, 900-902 (2004). 2. Borukhin S. Bloch L., Radlauer T., Hill A.H., Fitch A.N. and Pokroy B. "Screening the incorporation of amino acids in an inorganic crystalline host: the case of calcite". *Advanced Functional Materials*. 22. 4216-4224. (2012). 3. Brif A., Ankonina G., Drathen C. and Pokroy B. "Bio-inspired Band Gap Engineering of Zinc Oxide by Intracrystalline Incorporation of Amino Acids". *Advanced Materials*. 26. 477 (2014). 4. Koifman-Khristosov M, Kabalah-Amitai L, Burghammer M, Katsman A, Pokroy B. Formation of Curved Micron-Sized Single Crystals of Gold from Micro Droplets. *ACS Nano* 8. 4747 (2014).

This Conference Proceeding is brought to you for free and open access by the Proceedings at ECI Digital Archives. It has been accepted for inclusion in Composites at Lake Louise (CALL 2015) by an authorized administrator of ECI Digital Archives. For more information, please contact franco@bepress.com.

BIO-INSPIRED HYBRID NANOCOMPOSITES IN SINGLE CRYSTALLINE HOSTS; FROM STRUCTURE TO FUNCTION

Boaz Pokroy, Technion Israel Institute of Technology
bpokroy@tx.technion.ac.il

Key Words: nanocomposites, hybrid materials, hybrid interfaces, bandgap engineering, bio inspired.

Often crystals in nature exhibit fascinating mechanical, optical, magnetic and other characteristics. Such natural single crystals are very different than man-made crystals: they are in fact hybrid nanocomposites due to the incorporation of organic molecules within their crystalline lattice and often reveal intricate shapes and morphologies rather than clear facets.

In this talk I will show that we can emulate these two specific features demonstrated by organisms so as to form new structural materials with new properties and characteristics.

I will show that we can grow inorganic single crystals in which different organic molecules are incorporated on a nanometer scale. This incorporation has pronounced effects on the crystal structure of the crystal host and depending on the choice of materials can enhance the mechanical properties, manipulate its electronic properties and even serve as a drug delivery platform with highly controlled release properties.

I will also show that using this bio-inspired approach we can grow functional single crystals that demonstrate no facets but rather have intricate shapes such as nanoporous morphologies (nano sponge) or curved surfaces and yet maintain their single crystal nature.

We believe that our approach will open up new ways to control the structure and properties of smart materials.

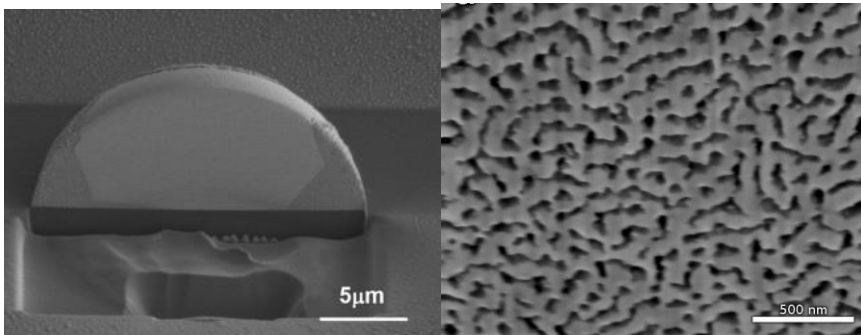


Figure 1 – Examples of single crystals which exhibit curved surfaces (left) or nanoporous morphologies

1. Pokroy B., Caspi E. N., Quintana J. P., Berner A. and Zolotoyabko E. "Anisotropic lattice distortions in biogenic aragonite". *Nature Materials*, 4, 900-902 (2004).
2. Borukhin S. Bloch L., Radlauer T., Hill A.H., Fitch A.N. and Pokroy B. "Screening the incorporation of amino acids in an inorganic crystalline host: the case of calcite". *Advanced Functional Materials*. 22. 4216-4224. (2012).
3. Brif A., Ankonina G., Drathen C. and Pokroy B. "Bio-inspired Band Gap Engineering of Zinc Oxide by Intracrystalline Incorporation of Amino Acids". *Advanced Materials*. 26. 477 (2014).
4. Koifman-Khristosov M, Kabalah-Amitai L, Burghammer M, Katsman A, Pokroy B. Formation of Curved Micron-Sized Single Crystals of Gold from Micro Droplets. *ACS Nano* 8. 4747 (2014).