Structural distortion of biogenic aragonite in Ranella Olearia mollusc shell layers

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Abstract (Poster)

Mollusc shells, mainly made of calcite and aragonite crystalline polymorphs of calcium carbonate, are fascinating organic-mineral biocomposites with high mechanical performances, as they attain a fascinating increase in both strength and toughness compared to the geological mineral. The major part of organic materials is intercrystalline, and in a minor way intracrystalline (Pokroy et al., 2006).The organic represents less than 5% in volume, is a biopolymer dispersed in inorganic crystal of calcium carbonate (Barthelat and Espinosa, 2007). This organic part behaves as nanometer growth-control of the inorganic crystals and also plays an important role in stopping crack propagation in nacre (Cortie et al.,2006). This has stimulated chemists and materials scientists to design and synthesize high performance materials with a microstructure similar to that of nacre (Wang et al., 2013).

In the present work we made use of Combined Analysis to determine the structure and unit-cell distortions of constituting aragonite crystallites of the shell layers (figure 1) of the gastropod *Ranella olearea*. This approach was chosen because it allows working on real samples, without grinding operation (Ouhenia et al., 2008). SEM analyses show the presence of three distinct layers; an inner layer composed of Radial Lamellar, an intermediate comarginal crossed lamellar layer and an outer crossed lamellar layer. The refinement of X-ray diffraction diagrams, gives quantitatively the structure of the three layers and their respective aragonite unit-cell distortions. An anisotropic unit-cell distortion is quantified for the three layers which is attributed to the combined effects of inter- and intra-crystalline macromolecules.

References.

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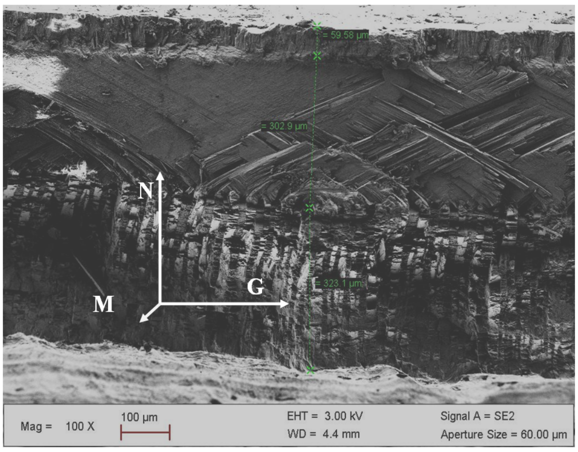

Figure 1: Cross-section SEM image of the fractured shell at the location indicated in G, M and N indicate the Growth, Margin and Normal directions, respectively.