

Texture and Microstructure of the outer layer of a brachiopod fossil from the Terebratulida order (-155 My)

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Introduction

Quantitative analysis of the crystallographic texture and microstructure of the biomineral layers of some invertebrates provide a better understanding of the species' phylogenetic placement, as well as they specify the purely mineral impact on their shell growth. The textures of the biomineral layers of the mollusc clade have been extensively studied, unlike to the brachiopod and bryozoan clades. We present the texture analyses of a fossilized brachiopod.

Materials and Method

Material

Outer calcitic layer of a fossilized brachiopod species of the Upper Jurassic (Kimmeridgien stage), belonging to the order Terebratulida. Sample collected in Loix-en-Ré, Charente-Maritime, France.



Bryozoans : (Horena robusta)

| c-axis | a-axis | |
|--------|--------|-----|
| // N | random | [1] |

Brachiopods : Terebratulida

This study

| Group | Species | c-axis | a-axis | Ref | |
|-----------------|---------------------------|------------------|------------|--------|-----|
| Mollusca : | Cephalopoda | // N | random | [2] | |
| | Baculites aragonite-nacre | | random | [2] | |
| | Bivalvia | Trichite | 15° from N | random | [2] |
| | | (Pteria penguin) | // N | random | [2] |
| (Pinna nobilis) | | // N | random | [2] | |
| | (Crassostrea gigas) | 35° from N | // M | [2] | |
| Crustaceous | (Lobster) | // N | random | [3] | |
| | (Barnacle) | // N | random | [4] | |

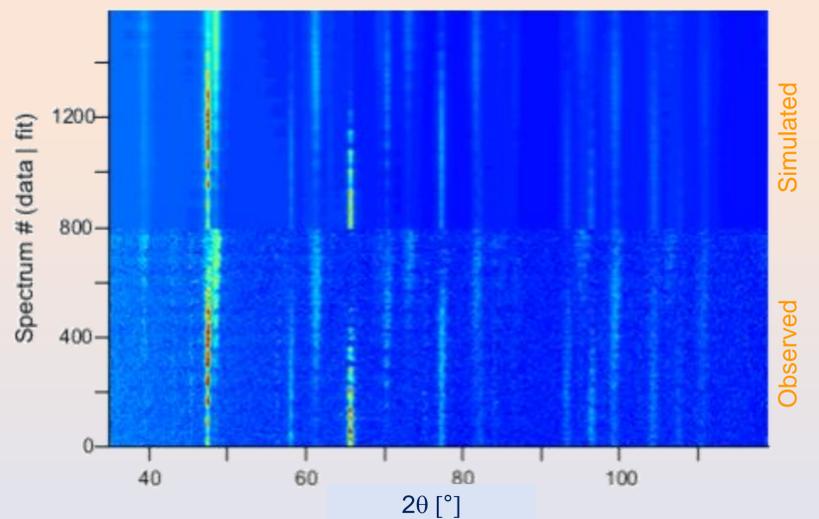
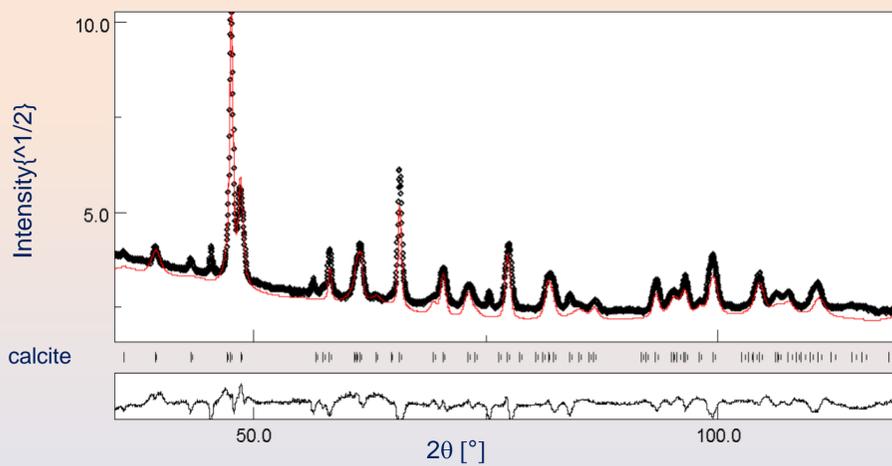
Method

"Combined Analysis" formalism [5] in MAUD software [6]:

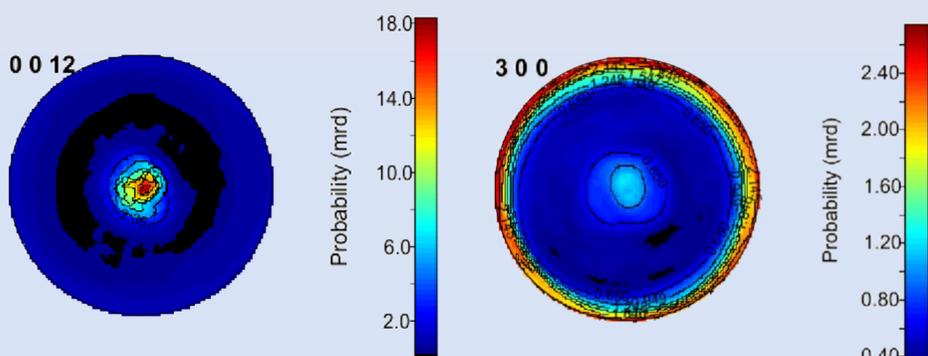
- cyclic Rietveld refinements [7] of the diffraction patterns measured for 792 different sample orientations;
- texture quantified through the refinement of the Orientation Distribution Function (ODF) of crystallites using the E-WIMV method [5].



Results



{0012} and {300} pole figures of calcite showing the c et a axes preferred orientations



c-axis // N and randomly oriented a-axes around <001>

Conclusions

- fiber texture with the <001> fiber axis perpendicular to the layer plane;
- randomly oriented a-axes around <001>
- this texture pattern was already observed in the fossil calcite layers, in mollusca [2], as well as in bryozoans [1].

References

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