Valorization of waste mussel shells by recovering aragonite and calcite single crystals from the shells

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Biominerals are inorganic/organic hybrid solids formed by organisms. In mollusk shells calcium carbonate is the main component, where it represents more than 95 wt.%. These biominerals are characterized by a shape, morphology, and composition that differentiate them from their geogenic and synthetic counterparts [1].
Mollusk shells are a waste by-product from aquaculture whose disposal represents an environmental and economic issue but they also are a renewable and cheap alternative source for biogenic calcium carbonate [2].
In this context, the presented research regards the valorization of waste mussel shells from the species *Mytilus galloprovincialis* in order to recover biomineral building units using a simple, sustainable, and environmentally friendly procedure [3].
Mussel shell consists of three crystalline layers (Fig. 1A): the inner layer of aragonite nacre, the outer layer of calcite fibrous prisms and the myostracum [4]. In order to separate the different layers, different treatments have been applied. They were: a bleaching process with NaClO solution to remove the outer organic periostracum layer; a thermal treatment for the mechanical separation of nacre; an acidic treatment with a CH_3COOH solution to remove the myostracum. The nacre layer was then separated into almost single aragonite tablets by a bleaching and sonication process (Fig. 1B) while the prismatic layer was crashed by mortar and pestle, sieved at 600 µm and treated with NaClO solution to obtain single fibrous crystals of calcite (Fig. 1C). The disassembled calcite fibers were stirred in water to form spherical aegagropilae-like aggregates of fibers (Fig. 1D) having a potential application for gas adsorption.

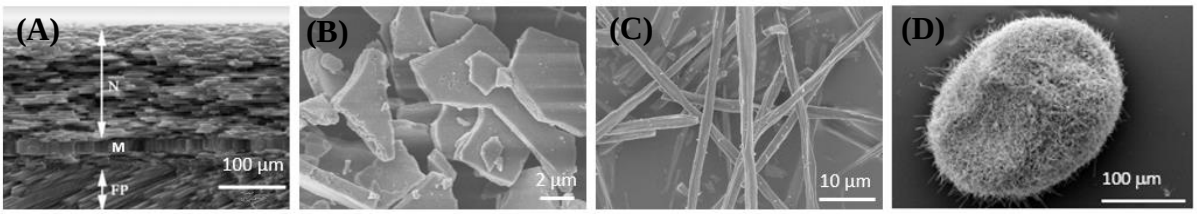

Figure 1: SEM images of mussel shell layers (A), isolated nacre tablets (B), calcite fibers (C) and aegagropilae-like aggregates of calcite fibers (D).

References

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