

## Three-Dimensional Reconstruction of *Halamphora coffeaeformis* Frustule from Scanning Electron Micrographs

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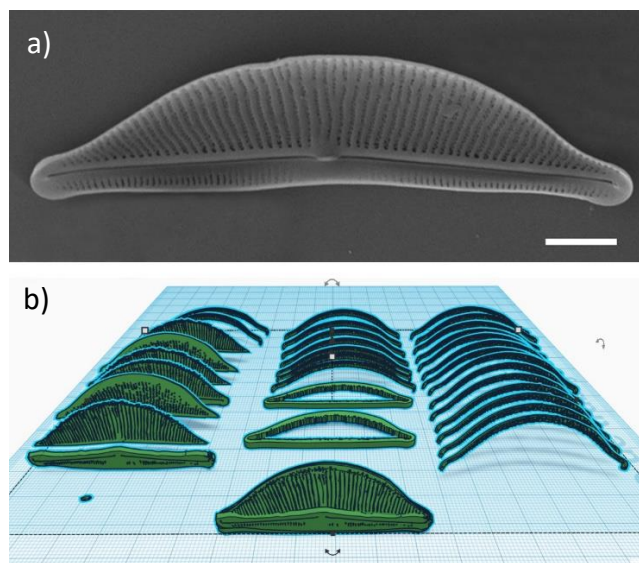
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The diatom *Halamphora coffeaeformis* represents an alternative feedstock of oils for the biodiesel production [1]. In addition, its siliceous cell wall (named frustule) presents possible industrial applications that have not been reported in the literature yet. Thus, the main objective of this study was to perform a three-dimensional reconstruction of *H. coffeaeformis*' frustule from scanning electron micrographs, in order to have a study model. For this, the biomass of the species growing in a photobioreactor was harvested and treated as follows: a) some samples were dehydrated and subjected to a critical point; and b) other samples were treated with H<sub>2</sub>O<sub>2</sub> in order to analyse the frustule's ornamental pattern. All samples were metallized with gold, using an Argon plasma metal evaporator (Pelco model3) and they were observed with a LEO Scanning Electron Microscope, model EVO 40 XVP 2004. The frustules were elliptical to lanceolate with protracted ends. Valves presented convex dorsal margin and straight ventral margin. Dorsal striae were biseriate and radiate; ventral striae were short, uniseriate, radiate at the center and convergent at the ends of the valves. The raphe was straight and close to the ventral margin (Fig. 1A). The micrographs were analysed and separated into layers with the Adobe Photoshop CS6 software. The layers were vectorised with the Inkscape software and loaded and assembled in the Tinkercad software (Fig. 1B). The final aspects of the digital model were moulded on the page <https://stephaneinier.com/sculptgl/>. Finally, 3D printing was done with a CoLiDoTM 3.0 L printer, obtaining a three-dimensional replica representative of the *H. coffeaeformis*' morphology (Fig. 2). This replica will serve as a model for studies of its frustules related to nanotechnology and /or catalyst support applications [2].

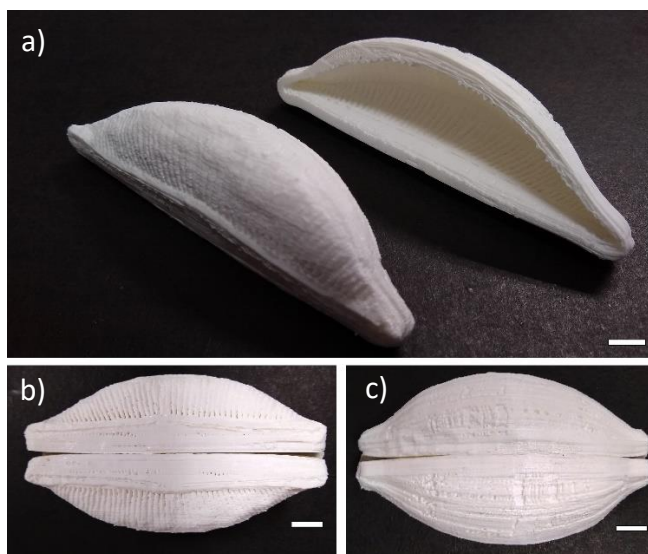
## References:

[1] L.A. Martín et al., *Renew. Energy* **118** (2018), p. 984.

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**Figure 1.** *Halamphora coffeaeformis*. a) Internal valve view of the frustule with dorsal and ventral striae separated by the raphe. Scale bar = 3  $\mu\text{m}$ . b) Vectorised and assembled images in the Tinkercad software.



**Figure 2.** Representative three-dimensional replica of the *H. coffeaeformis* frustule. a) Internal and external valve view. b) Ventral girdle view. c) Dorsal girdle view. Scale bar = 1 cm.