

Characterization of the Iron Metallome of *Corbicula* Species in Lake Biwa

KUNIKO TAKEMOTO¹, MASATAKA MURAKAMI²,
MASAO TABUCHI³, DAIYA BAMBA⁴ AND TOSHIKI
OHTA⁵

¹Kansai Medical University

²Toray Research Center, Inc.

³Nagoya University

⁴Toray Techno Co., Ltd.

⁵Ritsumeikan University

Presenting Author: takemoto@hirakata.kmu.ac.jp

The characteristics of the iron metallome are reported since we found the iron (Fe) metallome of *Corbicula* clams collected from Lake Biwa.

In Japan, the following three native *Corbicula* species have been recognized: *C. sandai*, *C. leana*, and *C. japonica*. The shell consists of a periostracum and calcareous layers made of calcium carbonate (CaCO₃). The periostracum is the outermost thin organic layer secreted from the inner surface of the outer mantle fold at the mantle margin [1]. Therefore, the color of the periostracum reflects the shell color.

The *Corbicula* species have a variety of shell colors, such as black, blackish-brown, yellowish-red, and yellow. Shell color is generally controlled by hereditary and environmental factors [2]. For the *Corbicula* species, yellowish-shell clams grow in sandy sediment, and blackish-shell clams grow in muddy sediment, indicating that the shell color is more dependent on the environmental condition of the deposit than on the species.

We investigated the relationship between trace elements in the periostracum and the periostracum color using a field-emission electron probe microanalyzer (FE-EPMA), Raman spectroscopy, infrared (IR) spectroscopy, and X-ray absorption fine structure (XAFS) spectroscopy.

Corbicula clams from Lake Biwa in Japan were used as samples. The periostracum consisted of protein with Fe and a small amount of manganese (Mn). Iron accumulated in the darker black periostracum abundantly. The local concentration of the black periostracum determined by EPMA was around 7%. XAFS indicates the oxidation state of the Fe to be +3 [3]. Raman and extended X-ray absorption fine structure (EXAFS) revealed that the iron formed a tris-DOPA-Fe complex with high rigidity [4]. It is postulated that the iron came directly from metal-rich sediments with an iron chelator, catechol, secreted by *Corbicula* clams.

References

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