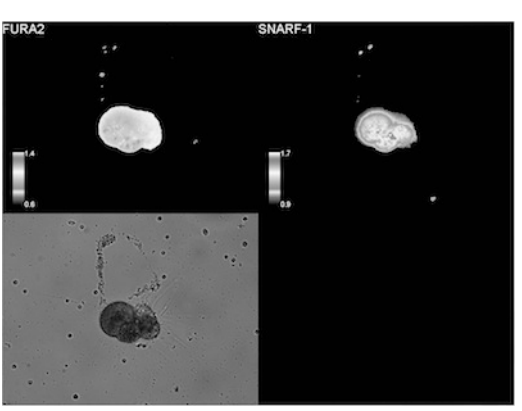
Microscopic imaging reveals geochemical process of foraminiferal calcification

TAKASHI TOYOFUKU[1*], MIKI YAMAMOTO[1], LENNART JAN DE NOOIJER2, SACHIKO KAWADA[1], YUKIKO NAGAI[1], HIROSHI KITAZATO[1]

[1] Japan Agency for Marine-Earth Science and Technology; Natsushimacho 2-15, Yokosuka 237-0061, Japan (*correspondence: toyofuku@jamstec.go.jp)

[2] Royal Netherlands Institute for Sea Research (NIOZ), Korringaweg 7, 4401 NT Yerseke, The Netherlands

Foraminifers are a unicellular marine organism. The organisms have been thought as one of the major carbonate producer in ocean. Their calcareous shells are preserved as fossils in sediment for geologic times. The fossils are utilized as paleo-environmental indicators in a variety of studies of geochemistry and paleocenography because diverse environmental information are brought by population, morphology and geochemical fingerprints. Finally, the calcareous test is interested by many geochemists. The knowledge about the cytological process on carbonate precipitation has been described for couples of decade using by multi approaches. Foraminiferal regulations of calcium and carbonate ion uptake into calcareous tests from ambient seawater under different pH conditions are of great interest. Our studies show the potential to understanding the biomineralization of foraminifera by the application of fluorescent indicators. Recently, we apply the method to show the spatial distributions pH and calcium concentrations around living cell. Observed results show that foraminifera severely controls ambient pH variation. These observations results will help to consider how the geochemical compositions arranging on the foraminiferal test, sensitivity of pH proxy of boron and others.



Double imaging of pH and calcium in living foraminifera