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Abstract
In this topic, I will introduce our study on the mechanism of a crease pattern on a hydorogel in the process of swelling. Most studies on an instability of the hydrogel swelling have been considered with constraint boundary condition. In our study, we investigated the mechanical instabilities of a disc-shaped thin plate of polyelectrolyte hydrogel with fast free swelling. In the lead up to an equilibrium swelling, the gel morphed into saddle-like shape with a polygonal surface due to two swelling mismatches, inner disc/outer annulus region, and surface layer/inner layers. And then, the polygonal surface crease pattern gradually changed to stripe-like pattern. The stripe creases were formed uni-directionally, and were normal to each other at the top and bottom surfaces. From the detail observation of an internal stress analyzed by the orientation of semi-rigid polyanions, we considered that both the surface creasing and bulk deformation minimize the swelling mismatch. And a theoretical energy model [1] was developed to show anisotropic stripe crease on a saddle shaped surface. These results might be helpful to develop novel strategies for controlling crease patterns on soft and wet materials by changing its three-dimensional shape.
[1] T. Tanaka, et al, Nature, 1987, 325, 796.

"The surface pattern that depends on the shape of swelling hydrogel"

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場所：明治大学 中野キャンパス高層棟 6 階　研究セミナー室 3