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The surface learned from nature

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In this work, I would like to introduce the emerging surface of nature. The surface in nature, has the multi and optimized function with well organized structure. There are so many examples that we learn and apply to technology.

First example is self-cleaning surface. Some plants (such as lotus leaf, taro leaf) and the wings of many large-winged insects (such as moth, butterfly, dragonfly) remain their surface clean in the very dirty environment. This self cleaning effect is accomplished by the superhydrophobic surfaces which exhibit the water contact angle of more than 150° with low sliding angle. Generally, the superhydrophobic surface is made up the two factors. One is the surface composition having the low surface tension energy. The other is the surface morphology of hierarchical structure of micro and nano size. Because almost nature surface have the hierarchical structures range from macro to nano size, their topography strength their function to adjust the life in nature environment.

The other example is the surface to use for drag reduction. The skin friction drag causes eruptions of air or water resulting in greater drag as the speed is increased. This drag requires more energy to overcome. The shark skin having the fine sharp-edged grooves about 0.1 mm wide known riblet reduces in skin friction drag by being far away the vortex.

Among a lot of fuctional surface, the most exciting surface the back of stenocara a kind of desert beetles. Stenocara use the micrometre-sized patterns of hydrophobic, wax-coated and hydrophilic, non-waxy regions on their backs to capture water from fog. This fog-collecting structure improves the water collection of fog-capture film, condenser, engine, and future building.

Here, the efforts to realize these emerging functional surfaces in nature on technology are reported with the fabrication method and their properties, especially for the control of surface wettability.