## Flux-grown Crystals for Innovations in Aqua Regeneration

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Water is one of the most essential substances for life. However, water pollutions in surface and groundwater have been one of major problems. The limited availability of clean drinking water remains a significant challenge in many regions across the globe. In response, we have been deeply committed to exploring viable solutions aimed at overcoming these problems. Our crystals, synthesized by Shinshu University's flux crystal growth technology, are one of the promising materials for water purification. The flux method is the process that grows crystals by liquidifying or vaporizing ingredients in order to recrystallize and rearrange the structure of atoms. It can grow a single crystal of various inorganic compounds at temperatures lower than their melting temperatures. The characteristics of crystals can be controlled by ingredients, fluxes and heating conditions. For example, sodium titanate (Na<sub>2</sub>Ti<sub>3</sub>O<sub>7</sub>) with the layered structure can be simply synthesized and resulted in an effective cation ion exchange, which led to the realization of commercial water purification systems these days. Moreover, recently we have been applying data-driven analysis to clearly understand thousands of materials and synthesis conditions that we conducted for not only water purification but also other water research and utilizing robotic approaches to accelerate our development. (200 words)



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Figure 1 Innovative development of the flux crystal growth process

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