

# Development of Next-generation Wastewater Treatment Technology Using New Biological Reaction

(Research of FY 2017-2021)

## 1. Purpose

This study aims to develop next-generation wastewater technology using new biological reaction, which can be expected to save energy and cost compared to the conventional one.

JS studies on the practical application of the technology in the next R&D basic plan "The fifth R&D Strategy." As a preliminary stage toward the plan, a bibliographic survey is made to collect information to extract promising water treatment technologies for practical application. After the survey, a feasibility study is carried out by basic research.

## 2. Achievement of This Year

Using "JDream 3," the researchers collected information about water treatment technologies for the past ten years. "JDream 3" is a database providing information services on science and technology. The survey focuses on the technologies related to the following two points.

### (1) New water treatment technology

The researchers set keywords that are "new or next-generation," "energy-saving," "cost-saving or low cost" in the discipline of "water quality pollution/water treatment." While JDream 3 did not provide any unknown documents of new water treatment technologies, it showed many

documents about “microbial fuel cell (MFC)” as search results. It is a synonym of “microbial battery” focused in the following section.

(2) Next-generation water treatment technology shown in “The forth R&D Strategy”

JS forth R&D Strategy lists “normal temperature Anammox,” “aerobic self-granulation” and “microbial battery” as “next-generation water treatment technologies.” The researchers set three keywords of “microbial fuel cell or microbial battery,” “Anammox,” and “self-granulation” to extract documents including synonyms in the field of “water quality pollution/water treatment.”

The search results showed as follows (table 1):

- Microbial battery: 682 papers (76%) of basic research such as the improvement of power generation efficiency, 159 (18%) relating the application of microbial battery to drainage, and 54 relating domestic wastewater or night-soil treatment can be candidates for applicable technologies for WWTPs
- Anammox: include 7 documents of Anammox that react in lower temperature than the conventional one
- Self-granulation: fewest documents were found.

Table 1: Number of document including key words

keyword	No. of documents
microbial battery	894
Anammox	321
Self-granulation	15

### 3. Conclusions

In 2017, the bibliographic survey was made as an information collection of new technologies. The survey did not extract any document relating

unknown wastewater treatment technology. On the other hand, the database provided some documents relating technologies listed in the fourth R&D strategy. JS had made an experimental research of “microbial battery” from 2009 to 2011. Microbial battery has not been practically applied yet, but it is still one of the promising technologies expected future development. “Anammox” has been actively studied and developed within our programs of joint research and technology evaluation, or B-DASH project of MLIT. Since some researchers get to study on Anammox reaction in low temperature recently, it can be expected to be the target technology of R&D in future. “Self-granulation” is a technology that has been practically applied to actual machines. While JS had implemented an experimental research on self-granulation from 2008 to 2010, the technology that still remains a matter of development and application is expected to be a target of R&D. Next year, a list of next-generation technology will be narrowed down based on the search result of this year. We will interview universities and research institutes to consider the feasibility of the selected next-generation wastewater treatment technologies.

---

***Keywords: ANAMMOX, self-granulation,  
microbial battery***

---