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 Mitsui Chemicals, Inc.  
 Sigma-i Co., Ltd.

## Mitsui Chemicals, Sigma-i Launch Experimental Study for Using Quantum Annealing Technology in Applications Such as Compound Searching

Mitsui Chemicals, Inc. (Tokyo: 4183; President & CEO: HASHIMOTO Osamu) has joined together with Sigma-i Co., Ltd. (Tokyo; Representatives: OHZEKI Masayuki, MIYAMA Masamichi), a company that provides R&D solutions applications based on quantum annealing, to begin an experimental study into using quantum annealing to speed up searches for materials. The project will look specifically at processes such as searching for compounds and optimizing compositions.

Product development usually requires many cycles of prototyping and evaluation in order to create the optimal product, necessitating significant time and monetary costs. In response to this issue, Mitsui Chemicals and Sigma-i have set their sights on a black box optimization technology using quantum annealing (Image 1), with the intent for this to serve as a method for selecting desired candidate materials through a small number of cycles even in situations where there is little data that can be used.

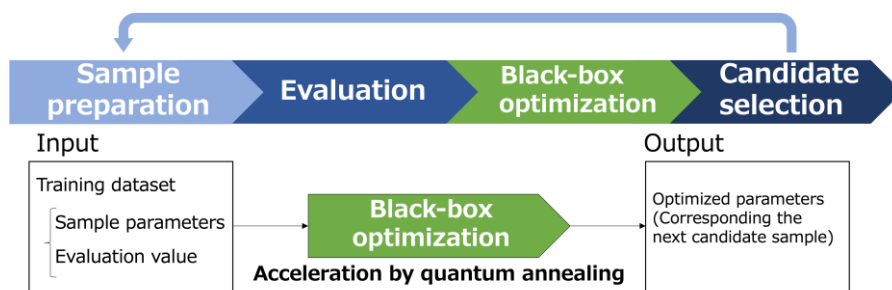


Figure 1. Black-box optimization accelerated by quantum annealing

By taking this black box optimization technology using quantum annealing and incorporating it in between the analysis and candidate selection phases of various approaches to product development – including experimentation, computational science and data science (Image 2) – the project has the potential to improve the precision of selected candidates. This could in turn help to reduce the time and cost needed to find optimal solutions.

Hopes are that this study will work in well with the expected spread of digital transformation throughout the chemical sector, as well as help to improve Mitsui Chemicals' capabilities in product development and marketing.

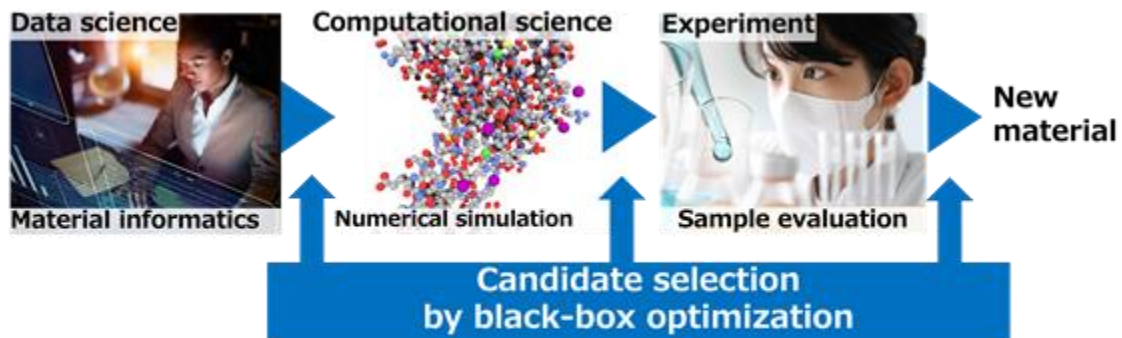


Figure 2. Diagram of product development applied black-box optimization

◆ Overview of the black box optimization technology using quantum annealing

Black box optimization technology is an approach for bringing values that cannot be known without experimenting and measuring – such as physical property evaluations – closer to targeted values. Meanwhile, a quantum annealing machine is a specialized computer able to leverage the power of quantum science to solve combinatorial optimization (discrete optimization) problems, and so is expected to speed up calculation bottlenecks in the black box optimization technology used in the project at hand. There are expectations for this technology to find use not only in searching for materials but also in a wide range of other search and optimization applications.

◆ Overview of Sigma-i

Sigma-i is a leading global startup targeting the quantum science era, which is moving from its birth to its growth. With proprietary core technology to surpass the limits of quantum annealing machines, Sigma-i is working to take research from Tohoku University – which has a long track record for utilizing quantum annealing – and implement it into society by way of joint development projects with various research institutes and companies.

In working together with its clients, Sigma-i offers R&D operations based on novel calculation platforms, including a quantum annealing machine from D-Wave Systems Inc. – the company having become the first in Japan to sign a major use agreement for one of these machines back in July 2019. At the same time, Sigma-i is engaged in the development of applications designed to become ever more familiar parts of the lives of numerous users and gently permeate throughout society.

Company website: <https://sigmailab.com/>