

Research: Substances present in alcohol found to influence superconductivity

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In previous research, the National Institute for Materials Science (NIMS) discovered that iron telluride compounds [Fe(Te,S) system], which are iron-based superconducting related substances, become superconductors when simmered in alcoholic beverages. In current research, NIMS and the Institute for Advanced Biosciences of Keio University identified substances in alcoholic beverages that induce superconductivity.

Using a metabolomics technique developed by IAB, which is called Capillary Electrophoresis-Time-of-Flight Mass Spectrometer (CE-TOFMS), comprehensive quantification was performed for the components contained in 6 types of [alcoholic beverages](#) [[red wine](#), [white wine](#), beer, whisky, Japanese sake, and shochu (a type of Japanese distilled alcoholic beverage)], and the possible candidate substances which induce superconductivity were narrowed down by comparing those components and the volume fractions of superconducting phases.

It was found that malic acid, citric acid, and β -alanine, which have particularly high correlations among the candidate substances, actually had an influence in inducing superconductivity.

Focusing on the fact that all the candidate substances have a chelating effect, after iron telluride sample was simmered in the alcoholic beverages and the above-mentioned three substances, the solutions were investigated and [iron ions](#) which appeared to have been eluted from the specimens were detected.

Based on the findings outlined above, the researchers concluded that the substances in alcoholic beverages that are responsible for inducing superconductivity are [organic acids](#) that have a chelating effect, and superconductivity is induced when these substances remove surplus iron, which suppresses superconductivity, from the specimens.

The negative effect of surplus iron on superconductivity can also occur to a significant extent in other iron-based superconductors. These research results are expected to provide new guidelines for research and development of iron-based superconductors.

These results are scheduled for publication in July in the Special Issue on Iron-based Superconductors of the interdisciplinary scientific journal *Superconductor Science and Technology*.

Provided by National Institute for Materials Science

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