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PRESS RELEASE (2026/04/17)

A simple way of making hydrogen from alcohol by using iron and UV light

Researchers discover a simple method of generating hydrogen gas by mixing iron ions with alcohol and irradiating it with ultraviolet light

Fukuoka, Japan—Publishing in *Communications Chemistry*, researchers from Kyushu University have discovered a simple method of generating hydrogen gas by mixing methanol, sodium hydroxide, and iron ions, then irradiating the solution with UV light. Furthermore, the catalytic activity of the reaction is comparable to that of some previously reported systems that use organometallic and heterogenous catalysts. The team also demonstrated that the method could generate hydrogen gas from other alcohols and biomass-derived materials, such as glucose and cellulose.

From microchip circuits to the medicine you take when you fall ill, everything in our lives requires catalysts. Naturally, research and development of catalysts are not only lucrative but essential to maintaining our modern lifestyle. Catalysts are usually composed of a matrix of metals and compounds organized in sophisticated structures. As a result, while catalysts can be very efficient, they are also potentially expensive and complicated to make.

"Our research group has long been interested in developing catalysts from abundant and inexpensive elements. This time we turned our eyes toward sustainability and investigated the utility of common metals as catalysts for producing hydrogen gas," explains Associate Professor Takahiro Matsumoto of Kyushu University's Faculty of Engineering who led the study. "Hydrogen is a clean energy carrier because it does not produce carbon dioxide when used. However, most hydrogen today is made from fossil fuels, so we must develop sustainable methods to produce it to have a positive ecological impact."

The team began by experimenting with generating hydrogen gas from methanol using organometallic iron complexes. Alcohols, such as methanol, are compounds that contain hydrogen which can be removed through a process called alcohol dehydrogenation. However, the process usually requires complex catalysts made from rare or expensive metals.

While conducting their experiments, the team encountered some unusual results.

"In what can only be considered incredible serendipity, we found in one of our control experiments mixing methanol, iron ions, and sodium hydroxide, and then irradiating it with UV light, generated a considerable amount of hydrogen gas," continues Matsumoto. "It was hard to believe at first. We validated these findings, experimented further, and confirmed them. We found that the hydrogen production rate was 921 mmol of hydrogen per hour per gram of catalyst. This number is comparable to the best catalysts reported to date."

The team also found that their new system could produce hydrogen from other alcohol species as well as from materials such as glucose, starch, and cellulose.

The team intends to develop their new findings in hopes that further optimization will lead to more sustainable hydrogen technologies.

"One limitation of this study is that we still do not know the reaction mechanism in detail. Addtionally, although we observed hydrogen generation from other materials, the catalytic

activity for these substrates is still low," concludes Matsumoto. "Finally, this reaction is so simple that anyone, from elementary school students to curious adults, can reproduce it. I encourage everyone to try it out, and I hope it inspires people to pursue careers in the sciences."

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For more information about this research, see "Iron ion enables photocatalytic hydrogen evolution from methanol," Masaya Sakurai, Yudai Kawasaki, Yuki Itabashi, Kei Ohkubo, Takahiro Matsumoto, *Communications Chemistry*, https://doi.org/10.1038/s42004-026-02009-3

About Kyushu University

Founded in 1911, Kyushu University is one of Japan's leading research-oriented institutions of higher education, consistently ranking as one of the top ten Japanese universities in the Times Higher Education World University Rankings and the QS World Rankings. Located in Fukuoka, on the island of Kyushu—the most southwestern of Japan's four main islands—Kyushu U sits in a coastal metropolis frequently ranked among the world's most livable cities and historically known as Japan's gateway to Asia. Its multiple campuses are home to around 19,000 students and 8,000 faculty and staff. Through its VISION 2030, Kyushu U will "drive social change with integrative knowledge." By fusing the spectrum of knowledge, from the humanities and arts to engineering and medical sciences, Kyushu U will strengthen its research in the key areas of decarbonization, medicine and health, and environment and food, to tackle society's most pressing issues.

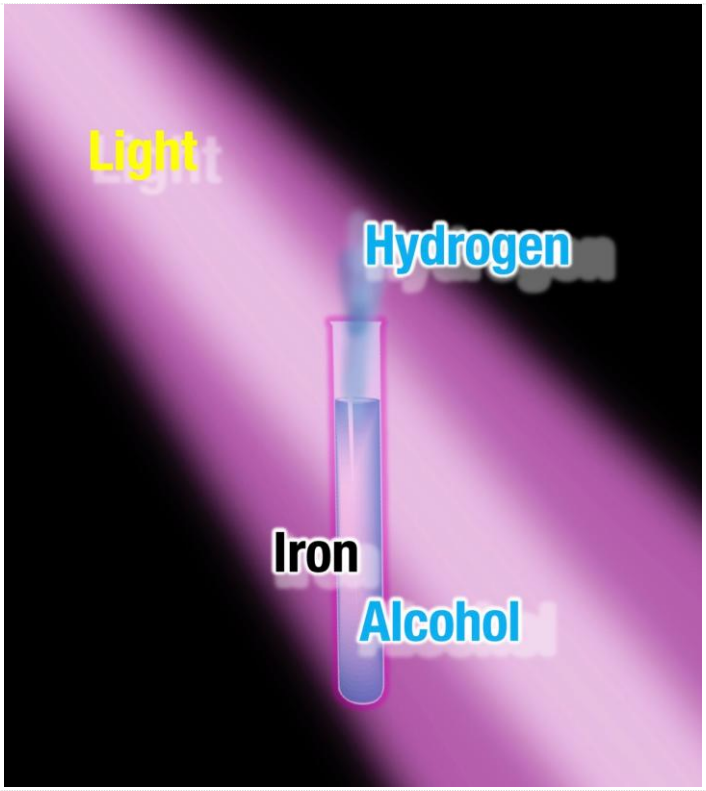

Fig. 1. Conceptual illustration of light-driven hydrogen generation. An illustration of the reported new method of generating hydrogen gas using alcohol, iron ions, and UV light. (Kyushu University/Matsumoto Lab)

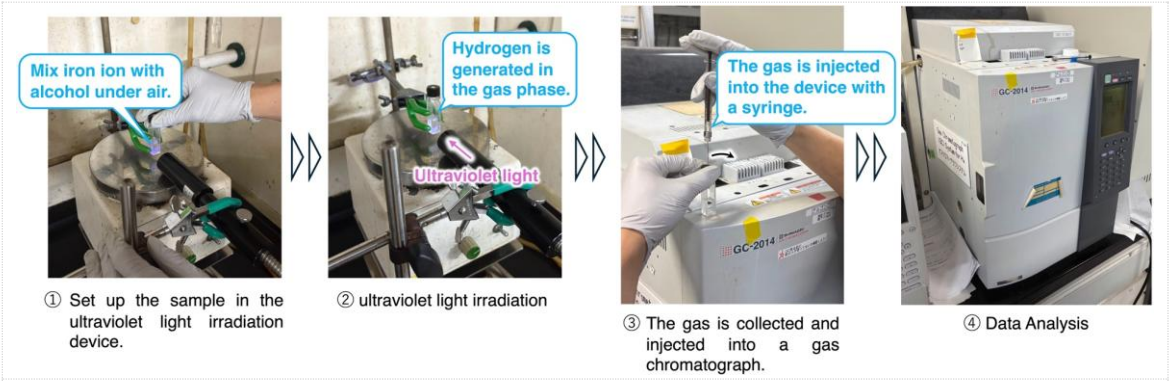

Fig. 2. Step-by-step experimental method. A step-by-step method of the hydrogen generating experiment conducted by the research team. A sample is made by mixing iron ions with alcohol and sodium hydroxide. The solution is then irradiated by ultraviolet light. The hydrogen gas generated by the procedure is then collected and injected into a gas chromatograph for data analysis. (Kyushu University/Matsumoto Lab)

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