Red wine offers clue to superconductive future

May 13 2011, by Miwa Suzuki

Yoshihiko Takano (R), professor of Japan's National Institute for Material Science and researcher Keita Deguchi display a superconductive metal compound, which is seven times higher when dipped in red wine than for ethanol or water at his laboratory in Tsukuba city, suburban Tokyo. The researchers plan to showcase their surprise findings later this year.

Japanese scientists at a boozy office party stumbled across a discovery they hope will help revolutionise efficient energy transmission one day:

red wine makes a metal compound superconductive.

The researchers plan to showcase their surprise findings later this year, the 100th anniversary of the discovery of the phenomenon of superconductivity, the zero-loss flow of electricity through certain materials.

The "eureka" moment came when National Institute for Materials Science researchers found that an iron-based compound became superconductive after being soaked in alcoholic drinks such as beer, wine and sake.

Red wine was the hands-down winner in producing the desired physical effect, although no-one is quite clear yet on how exactly it worked, said researchers at the institute in Tsukuba, east of Tokyo.

The ratio at which compounds became superconductive was seven times higher when dipped in red wine than for ethanol or water. It was four times higher for white wine and three times higher for beer, sake and whisky.

"The better it tastes, the more effective it is," the institute's lead researcher Yoshihiko Takano said, while allowing that taste is subjective.

"There may be a connection between the substance we humans sense as a taste and the substance that induces superconductivity.

"It is as if a detective was tracking down the culprit in a suspense story -- the guy is in the glass, but we still don't know if he is acting alone or conspiring with others."

The team hopes the find will help in the quest to one day unleash the

potential of superconductivity to build power infrastructure that reduces energy use and mankind's reliance on climate-changing fossil fuels.

When an electric current passes through a conductor such as copper and silver, part of the charge is lost as heat, a loss that increases with the distance the charge travels.

In superconductivity -- first discovered in mercury in 1911 -- electrical resistance suddenly drops to zero in some metals when they are cooled to near absolute zero (-273 degrees Celsius, -459 Fahrenheit).

This also produces a strong magnetic field -- an effect which has found applications, including in MRI body scanners.

To achieve zero-loss power transmission now, cables encased in tubes can be cooled with liquid nitrogen to make them superconductive -- but the complex and expensive technology has not been commercially used on a large scale.

Power companies have run only small-scale and pilot projects.

Yoshihiko Takano, professor of Japan's National Institute for Material Science, displays a superconductive metal compound, which is seven times higher when dipped in red wine than for ethanol or water at his laboratory in Tsukuba city, suburban Tokyo. The researchers plan to showcase their surprise findings later this year.

The dream is, however, to one day find materials that can become superconductors at room temperature, which would allow zero-loss transmission of power over vast distances.

"This may sound like the stuff of dreams, but electricity generated by solar power in the Gobi desert (of China and Mongolia) could be transported to the other side of the globe," said Takano.

"The sun is always shining somewhere on Earth, and the dream is for

electricity to be transported to far-away places with no power loss.

"Imagine there is a ring of superconductive cables along the equator with solar cells attached at certain places. If there were branches, clean electricity could be dispatched to the remotest rural areas."

Mamoru Mohri, a former astronaut who heads the National Museum of Emerging Science and Innovation in Tokyo, said advances in superconductivity could ring in "an era in which we don't have to burn as much fossil fuel".

Takano's team made their discovery when they put tablets of an iron-based compound called Fe(Te,S) into alcoholic drinks at an office party a year ago.

The team found that after being soaked for 24 hours in red wine or other alcoholic beverages, the compound became superconductive when cooled to about minus 265 degrees Celcius (minus 445 Fahrenheit).

Takano plans to present his findings at a European conference in September in The Hague, near Leiden where Heike Kamerlingh Onnes discovered superconductivity 100 years ago.

Reiji Ogino, power-industry analyst at Mitsubishi UFJ Morgan Stanley Securities, said the hunt for new electricity transmission methods has sped up as the world looks to reduce carbon dioxide emissions.

"I'm looking forward to seeing a technical breakthrough," Ogino said -- but he cautioned that it remains unclear how much it would cost to replace existing transmission networks.

Tomoaki Fujii, who heads equity research at Morningstar Japan, said superconductivity is "a technology with high expectations", but said that

it is "a bit too early" to start buying related stocks just now.

"We haven't seen superconductivity used for electricity transmission even 100 years after it was discovered," he said. "And we would have to see how smoothly it could actually be utilised".

(c) 2011 AFP