Decode the mystery of the Mpemba effect

Scientists have discovered the reason why hot water freezes faster than cold water. Mpemba effect - strange properties in the connection between hydrogen gas atoms and oxygen in water molecules.

Although this may sound seriously unreasonable in the physical industry, when placed under certain conditions hot water will freeze faster than cold water. This strange phenomenon was discovered by **Aristotle** himself, but after many years of trying to experiment to prove that no one had given a satisfactory explanation.

At the present time, physicists point out that some of the strange properties of hydrogen bonding are the key to decoding one of the oldest secrets in this physics. However, some other scientists disagree and they think this so-called " *Mpemba effect* " does not exist.

There are many difficult issues surrounding this Mpemba effect, which causes problems for physicists by Aristotle for the first time discovered more than 2000 years ago.

Then physicists like Francis Bacon and René Descartes, the ability to freeze hot water faster than cold water was finally widely accepted in the 1960s, thanks to the Tanzanian student who had noticed to this effect when making ice cream.

Erasto Mpemba and his classmates often make ice cream with boiled milk, mix it with sugar and let it cool before putting it in the refrigerator to freeze. One day, Mpemba felt impatient to wait for the cold milk mixture before putting it in the refrigerator, he put the still hot milk in the refrigerator and hoped it would freeze faster.

This makes many people feel surprised when Mpemba ice cream is faster than their classmates. In 1969, Mpemba collaborated with a physics professor to produce an article describing this obvious phenomenon.

But here is a big problem with **the Mpemba effect** . While the Mpemba effect is accepted less or more by the fact, physicists disagree about how exactly it works. Many people do not consider this an obvious fact of physics, but many physicists acknowledge that this phenomenon exists but cannot find a satisfactory, accurate explanation for this phenomenon. . So how can hot water freeze faster than cold water, when it is clear that cold

water has a temperature closer to that freezing point?

There are many difficult issues surrounding this Mpemba effect. The problem lies in the test itself, when there are people who can make the Mpemba effect appear but some people do not. Both evidence comes from two test results that did not give a reasonable explanation.

In 2012, the *Royal Society of Chemistry* organized a major competition asking scientists to explain this physical phenomenon. Despite receiving more than 22,000 research results from scientists from all over the world, there was no satisfactory explanation.

Scientific journalist **Signe Dean** works at **National Geographic** Australia:

> " *The most widely accepted and accepted hypothesis is that hot water evaporates faster, loses weight faster and therefore requires less heat to freeze. However, scientists have also re-demonstrated the effect. Mpemba application in a closed container, where evaporation cannot occur.*
>
> *Another theory is that water creates a convection current and a specific temperature gradient when it cools to freezing point.*
>
> *A cup of hot-water hot water will have a much higher temperature difference during its cooling and the cup surface will lose heat faster. Meanwhile, a cup of cold water has less temperature difference, so it will have less convection flow to accelerate the cooling speed.*
>
> *However, this opinion has not been officially recognized .*

So after several centuries of research and exploration, we still have not got a satisfactory answer. However, that may change with this study.

Now, scientists from the Southern Association of Methodists at Dallas and Nanjing University in China say they have found an answer to this physical mystery: finding strange properties in the connection between hydrogen gas atoms and oxygen in water molecules.

Simulation of water molecules on computers shows the power of *hydrogen bond* depending on their position compared to neighboring water molecules.

" *When water is heated, weak bonds will be broken, free molecular groups will be combined into freezing structures when the temperature drops, which is the first step to freeze water.* " , researcher Emily Conover told Science News.

" *For cold water, to be able to close into ice, weak hydrogen bonds will have to be broken first* ."

In other words, we find a higher percentage of strong hydrogen bonds in hot water than cold water, because the weaker hydrogen bond is broken when the temperature rises. What hot water is already available, can explain why hot water froze faster.

Researchers from two universities concluded as follows:

> " *Analysis . led us to the ability to find an explanation for the Mpemba effect. In warm water, weak electrostatic hydrogen (H-bonds) bonds will be broken, the bonds strong retention after boiling water will accelerate the process of creating ice crystal structure, thereby accelerating the freezing process, so the water freezes faster than cold water while the conversion From random water links will not take time and energy as cold water* ".

But the explanations before this study, we will need more specific experiments before we can be sure of this or a combination of factors - true evidence of convincing evidence for the brand. Mpemba application.

While some of the issues replicated in several elements linked together in different ways to obtain this phenomenon - including convection, evaporation and supercooling (*thermodynamics*) - and indeed freezing is a gradual process, not instant, but many others say that the Mpemba effect is nothing more than a persistent mystery.

A recent scientific report was made by a team from the Royal College of London that monitored the time of hot and cold water falling to freezing (0 degrees C).

" *No matter what we have done, we cannot observe anything similar to the Mpemba effect* " - Henry Burridge, one of the researchers, responded to the Science News website.

So what's really going on here? There are so many proven trials that make those who wonder, as well as scientists, difficult to explain. This strange physical phenomenon has not been clarified after many centuries and it seems that we have only been able to find the cause - even after many centuries.