

# Candle flames contain millions of tiny diamonds

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(PhysOrg.com) -- The flickering flame of a candle has generated comparisons with the twinkling sparkle of diamonds for centuries, but new research has discovered the likeness owes more to science than the dreams of poets.

Professor Wuzong Zhou, Professor of [Chemistry](#) at the University of St Andrews has discovered tiny diamond particles exist in candle flames.

His research has made a scientific leap towards solving a mystery which has befuddled people for thousands of years.

Since the first candle was invented in ancient China more than 2,000 years ago, many have longed to know what hidden secrets its flames contained.

Dr Zhou's investigation revealed around 1.5 million diamond nanoparticles are created every second in a candle flame as it burns.

The leading academic revealed he uncovered the secret ingredient after a challenge from a fellow scientist in combustion.

Dr Zhou said: "A colleague at another university said to me: "Of course no-one knows what a candle flame is actually made of.

"I told him I believed science could explain everything eventually, so I decided to find out."

Using a new sampling technique, assisted by his student Mr Zixue Su, he invented himself, he was able to remove particles from the centre of the flame – something never successfully achieved before – and found to his surprise that a candle flame contains all four known forms of carbon.

Dr Zhou said: "This was a surprise because each form is usually created under different conditions."

At the bottom of the flame, it was already known that hydro-carbon molecules existed which were converted into carbon dioxide by the top of the flame.

But the process in between remained a mystery.

Now both diamond nanoparticles and fullerenic particles have been discovered in the centre of the flame, along with graphitic and amorphous carbon.

The discovery could lead to future research into how [diamonds](#), a key substance in industry, could be created more cheaply, and in a more environmentally friendly way.

Dr Zhou added: “Unfortunately the diamond particles are burned away in the process, and converted into carbon dioxide, but this will change the way we view a candle flame forever.”

The famous scientist Michael Faraday in his celebrated 19th century lectures on “The Chemical History of a Candle” said in an 1860 address to the light: “You have the glittering beauty of gold and silver, and the still higher lustre of jewels, like the ruby and diamond; but none of these rival the brilliancy and beauty of flame. What diamond can shine like flame?”

Rosey Barnet, Artistic Director of one of Scotland’s biggest candle manufacturers, Shearer Candles, described the finding as "exciting".

She said: "We were thrilled to hear about the discovery that diamond particles exist in a candle flame.

"Although currently there is no way of extracting these particles, it is still an exciting find and one that could change the way people view candles. The research at St Andrews University will be of interest to the entire candle making industry. We always knew candles added sparkle to a room but now scientific research has provided us with more insight into why.”

Provided by University of St Andrews

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