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Explosive power makes silicone robot jump

Simple chemical reaction powers robot to make lofty leaps.

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Robot hop

A silicone robot gets a lift from controlled explosions.

SOURCE: REF. 1

Kaboom! Controlled explosions in the legs of this silicone 'soft robot' make it leap higher than 30 times its own height.

Researchers led by George Whitesides, a chemist at Harvard University in Cambridge, Massachusetts, have engineered a three-legged silicone device that is powered by combustion — previously used only in hard systems such as diesel engines.

The soft robot has in each of its legs a channel with a soft valve at the end. Methane and oxygen gases are fed into this channel in a ratio of one part methane to two parts oxygen. The computer that controls how much gas is let in also controls a high-voltage cable connected to electrodes in each leg.

When the computer sparks the electrodes, the methane and oxygen explode, turning into carbon dioxide and water — and releasing a lot of energy. The downward force from the explosion makes the robot jump — higher than 30 centimetres so far, although the researchers say the range has been limited by the height of the testing chamber. The soft valve is crucial, says Robert Shepherd, a study co-author and engineer at Cornell University in Ithaca, New York. It closes in response to high pressure, thus making the pressure even higher, and then it opens after the explosion to let the exhaust gases out.

Soft robots are lighter and simpler than hard systems, and they are relatively inexpensive to produce — but they have previously been limited to compressed-air power, owing to the high heat generated in combustion reactions. “The key discovery is that this material can work at these high temperatures,” says Shepherd. The robot has withstood more than 30 consecutive explosive jumps so far. The results were published this week in *Angewandte Chemie*[1].

The researchers hope that a developed version of their device could be used for search-and-rescue operations, leaping and cartwheeling its way over any obstacles that might block its path.

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References

1. Shepherd, R. F. *et al*. *Angew. Chem. Int. Edn Engl.* http://dx.doi.org/10.1002/anie.201209540 (2013).