

Lasers build three-dimensional circuits

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Making a three-dimensional circuit is no easy task. At the moment, chip designers build them layer by layer but this is a tedious process and it limits the designs that can be used.

Now Jianrong Qiu, a physicist at the Shanghai Institute of Optics and Fine Mechanics, and colleagues from China and Japan have worked out a way to draw the desired circuit directly into a block of glass. The secret was to add gold oxide to the glass, at a concentration of one part in 10,000. Then they focused short laser pulses on to specific points inside the block, to dislodge individual atoms of gold. When the block was heated to 550C, the gold atoms coalesced into tiny globules.

In the paper [`Manipulation of Gold Nanoparticles inside Transparent Materials`](#) published in the latest edition of Angewandte Chemie journal the researchers present the technique to create three-dimensional images in the glass.

The Au₂O₃-doped glass was irradiated by femtosecond laser beams. With increasing light intensity, the color of the laser-irradiated areas became violet, red, or yellow. Experiments have confirmed that it is possible to control the diameter and longitudinal spread of the structurally changed area from several hundred nanometers to several millimeters. It is also possible to erase structures after they have been created by using a second set of laser pulses to blast the golden globules apart.

The team's next goal is to make working circuits running through the glass. The researchers also suggest that the technique could be used for

storing data. The presence or absence of a nanodot at each point within a three-dimensional grid could signal a bit of computer data. Three dimensions means faster chips and more memory, although the method is unlikely to be cost-effective in the near future.

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