Physicists have created a superfluid solid

Researchers from Switzerland and the United States reported the first success in obtaining exotic phases of matter – a superfluid solid.
Solid, liquid and gaseous phases of a substance, as well as plasma know almost everything. However, this list of them is far from exhausted, and exotic (to us) conditions, there are other phases - such as superfluid solid. Theoretically predicted half a century ago, this phase is still never been observed in practice.

In 2009, American scientists have proposed an experiment to produce a superfluid solid, the particles of which "caught" and cooled to near absolute zero between the laser beams of the optical lattice. However, attempts to implement such an experiment ended in failure.

Loud statement about getting the superfluid solid rubidium, made Dan Stember Cournou (Dan Stamper-Kurn) at the meeting of the American Physical Society, after careful inspection and was not too reliable evidence.

Particles superfluid solid body arranged in a crystal lattice, and really keep the hardness. However, it shows some unusual properties of conventional solid body - in particular the lack of zero viscosity and internal friction. It is predicted that helium-4 may transition to a state at a temperature somewhat nanokelvin. A promising attempt to get him was made to a group of Moses Chan (Moses Chan) from the University of Pennsylvania in 2004. Later, however, reproduce and confirm these results did not succeed, and a renowned expert in the field, John Reppy (John Reppy) found received Chen According to another explanation, without solid state superfluidity. As a result of all the experiments on obtaining a phase of matter still remain controversial.

However, now with the statements of the observations of this exotic phases were just two groups of scientists. Reports of their experiments the team of Nobel laureate Wolfgang Ketterle (Wolfgang Ketterle) from the Massachusetts Institute of Technology and a team Donner Tobias (Tobias Donner) of the ETH Zurich presented the service preprint arXiv (1, 2).

The two groups working independently of each other, using the Bose condensation - Einstein exotic another phase which obtain in the laboratory can now be quite easily. In this state, the bosons are at minimum energy levels, allowing quantum effects occur at the macroscopic level (for the first experimental demonstration of a Bose condensate in 1995, Wolfgang Ketterle just won the Nobel Prize). This time, scientists from the US and Switzerland have created a Bose-condensate of helium-4 ordered the change in density as a 'virtual' lattice, moreover, that the substance as a whole remained liquid and demonstrated superfluidity.

Bearing in mind the problems of previous studies, no Ketterle nor Donner in no hurry to publish their reports in the 'big' magazines, waiting for validation of the results by independent groups and experts. However, the authority nobelista MIT - and his Swiss colleagues - allows good reason to believe that this time the superfluid solid will still be received.