

INCREASE OF PHASE TRANSITION TEMPERATURE OF CuInP_2S_6 CRYSTALS BY OXYGEN DOPING METHOD

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Recently, there has been an increased interest in two-dimensional layered crystals with multiferroic properties. Among them, of particular interest are CuInP_2S_6 crystals, in which ferroelectric properties are observed at room temperature, and they remain stable even when the active layer thickness is reduced below 4 nm [1]. This property makes it a promising candidate for use as a sub-gate dielectric layer (to create field-effect transistors with negative capacitance, to improve subthreshold swing) and as an active material for the creation of small-sized ferroelectric memory cells.

One of the few disadvantages of CuInP_2S_6 crystals is the relatively low Curie temperature of 315K, which limits the temperature range of using devices based on it. To overcome this limitation, two solutions are currently known: using crystal compression, which leads to an increase in the phase transition temperature [2], or growing stoichiometrically deviated samples with an increased amount of indium [3], which leads to similar results.

We found another possibility to increase the phase transition temperature of CuInP_2S_6 crystals. When studying the temperature dependence of the dielectric permittivity of these crystals enriched with oxygen, we observed an increase in the Curie temperature by 20 degrees (336K). Since oxidation is a standard method in the semiconductor industry, the observed phenomenon can be utilized in the design of future devices using CuInP_2S_6 layered ferroelectrics to increase their temperature range.

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3. M.A.Susner, M.Chyasnovichyus, A.A.Puretzky and others, *ACS Nano*, 2017, Vol. 11, 7060–7073.