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From macro- to microcrystals

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**Introduction.** Crystals are all around us. Crystals are solids having "repetitive", so-called, periodic structure forming regular polyhedra. Arrangement of particles is described as a crystal lattice. This is a three-dimensional model of arrangement of the particles in the crystal. The crystal lattice can be thought of as an array of “small boxes” infinitely repeating in all three spatial [directions](http://en.wikipedia.org/wiki/Three-dimensional_space). Such a unit cell is the smallest unit of crystal that contains all of the structural and symmetry information to build-up the macroscopic structure of the lattice. Crystalline compounds can form one single crystal. However, most crystalline compounds are composed of many small crystals, i.e. they are polycrystalline. Single crystals are usually obtained artificially. Sizes of crystals vary from microscopic to a few meters.

Scientific activity of Medical and Bioorganic Chemistry Department is devoted to the investigation of medicines which contain caffeine. Caffeine (1,3,7-trimetylxanthine) is widely used in medicine. It is applied in diseases involving suppression of central nervous and cardiovascular systems, brain vascular spasm (migraine), poisonings with drugs which depress the central nervous system, for increase of organism resistance to mental and physical stress, etc. Caffeine promotes the analgesic effect of nonnarcotic analgesics. Moreover, caffeine plays stimulating role in a human organism, because it makes the liver to release sugar in bloodstream. Caffeine postpones fatigue and increases human endurance. Also caffeine increases level of serotonin concentration, so it acts as a good psychostimulator. Caffeine consumption increases alertness, ability to concentrate, problem-solving ability, wakefulness, so caffeine plays “cognitive” function.

**Aim.** The aim of the work was to grow artificially, besides macro crystals of other chemical substances, the microcrystals of caffeine.

**Materials and Methods.** Crystals can be obtained during the crystallization of melt, solution or gas. In laboratory crystals are usually obtained from solutions. Crystals of solute begin to precipitate upon cooling of saturated solution, as solubility decreases with lowering of temperature. In our experiment we used condensation method. We put some quantity of black tea in a small vessel. On this vessel we put objective glass and heated it.

**Results**. By cooling method we obtained crystals of blue vitriol (CuSO4), table salt (NaCl), ammonium dihydrogen phosphate (NH4H2PO4), sucrose (C12H22O11), potassium alum ([K](https://ru.wikipedia.org/wiki/%D0%9A%D0%B0%D0%BB%D0%B8%D0%B9)[Al](https://ru.wikipedia.org/wiki/%D0%90%D0%BB%D1%8E%D0%BC%D0%B8%D0%BD%D0%B8%D0%B9)(SO4)2 · 12[H2O](https://ru.wikipedia.org/wiki/%D0%92%D0%BE%D0%B4%D0%B0)), and needle-like crystals of caffeine which are so small that they are invisible to the naked eye and can only be observed under a microscope at a 100-fold magnification. In experiment with caffeine, we obtained white matt coating on the surface of objective glass. On verification with electronic microscope the crystals appeared to be crystals of caffeine.

**Conclusions.** Crystals of various chemicals, including caffeine microscopic crystals, which possess pharmacological activity, can be grown in vitro.