Suspend the crystals, and they grow better

December 22 2012

The idea is so simple you wonder why no one thought of it before.Crystals growing near the bottom of a beaker are subject to convection,but it is much quieter near the top of the beaker.In that case, why not just let them grow hanging in the beaker?Well, the idea was there for the taking, and that is exactly what Elias Vlieg and his team from Radboud University Nijmegen have done.Their work will be published in this month's edition of *Crystal Growth & Design*.

Proteins are the building blocks of life and incredibly complicated. Because their structure determines the way that they work, many researchers are attempting to define the structure of protein molecules as accurately as possible. No easy task, as they first need crystals - pure crystals. The best way to obtain such pure crystals is to let them grow slowly, with no vibrations or other disturbances. You cannot therefore just leave them in a beaker in a quiet corner of the room; the density differential means that the solution flows under the influence of gravity and the crystal grows too quickly.

Into space...

If gravity is the problem, then into space with them - crystal growth experiments have been carried out in weightless conditions in space for 25 years already. Elias Vlieg, Professor of Solid State Chemistry at Radboud University Nijmegen, also once sent crystals into space to grow in an unmanned satellite, though with disappointing results - a situation that has not much improved. 'Scientifically speaking, it is a dead end.'

... or suspended in a magnet

The university in Nijmegen has got a magnet sitting in its back garden that is so strong it can work against gravity: the HFML. In 2007, Vlieg successfully crystallised proteins in the magnetic field produced by the HFML. In doing so, all the problems involved with growing crystals under the effect of gravity were avoided: no lower density solution flowed above the crystal. And then came the Eureka moment: why not just do away with 'above'? Hang the crystals seeds high up in the solution and make sure that nothing else can flow above them - no more need for spaceships or magnets!

Developed and investigated

The idea was thoroughly tested by the Egyptian PhD student Alaa Adawy, with remarkably good results. The hanging crystals grow more perfectly than the 'old' type and therefore diffract X-rays to much higher resolution limits (X-ray diffraction is the standard method for determining protein structures). Vlieg's idea has been well received and he hopes that other researchers will soon start growing crystals using this method. In his laboratory, all the hanging crystals have done better than the others. 'The crystallisation of proteins is high precision work; everything in the solution has to be exactly right - the salt concentration, the temperature - it in an industry in itself. Achieving such an improvement in results just by changing one factor is spectacular.'

More information: Crystal Growth & Design, High Resolution Protein Crystals Using an Efficient Convection-Free Geometry, *Crystal Growth & Design*, DOI: 10.1021/cg301497t .

Provided by Radboud University Nijmegen