Brno, October 6 (ČTK) - The possibilities of using X-ray tomography and light microscopy in engineering were presented at a conference at the International Engineering Fair by researchers from the association under the cross-border project ImageHeadstart. Light microscopy, for example, could help with the development of materials with better properties, Dalibor Štys from the Institute of Complex Systems of the Faculty of Fisheries and Protection of Waters University of South Bohemia in České Budějovice told to the ČTK.

"X-ray tomography is currently experiencing enormous development, as it allows you to look inside the material and look for possible defects in it. It is widely used, for example, in aviation. Our colleagues from Telč deal with fast tomography in our project, i.e., how to get the result as quickly as possible. We deal with super-resolution light microscopy," said Štys.

The researchers use a high-resolution digital camera, and with its help, they can display the observed sample in such detail that they reach the limit of electron microscopy. "Our contribution to microscopy for materials engineering is that we have come up with a method to determine the spectrum in the visible region at every point of the camera, and thus we are able to determine the chemical composition with an accuracy of 220 nanometres by 220 nanometres. This is the resolution that commonly used in routine material analyses on electron microscopes," explained Štys.

However, the equipment developed in the ImageHeadstart project is significantly cheaper than an electron microscope. "Our accuracy of imaging and determining the position of objects is not as great as that of an electron microscope. But on the other hand, we know that optical lithography is used in the production of silicon chips, where we also talk about units or tens of nanometres. There must be a possibility to build lenses achieving this accuracy. We won't get to those lenses, but as soon as we do, we are ready to extract all the chemical and spectroscopic information from our materials, and therefore also the chemical composition of the material," added Štys, adding that the project would need to get a partner, who would share the necessary technology with the researchers.

Researchers bring new questions to material science with their approach. "Thanks to our detailed visualization, one particular structural phase in steel production can be divided into several other sub-structural phases. If research was to take advantage of this and find out whether these sub-structures are significant for the resulting properties of steel, it would be possible to introduce a new step into steel production, which could lead, for example, to better mechanical properties," he specified.

Although the ImageHeadstart project has now organized a final conference at the MSV after three-year solution period, but it will continue as a cross-border cooperation for the next three years.

ska