

A new material quickly identifies the presence of harmful ions in food products

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A team of scientists from MSU has developed a new material based on silicon-titanium gel and a dye agent. The material is able to reveal the presence of harmful oxalate ions in food products even in field conditions. Analysis entails only bringing the sample into contact with the new material. The results of the study were published in *Sensors*.

Oxalates are the salts of oxalic acids. Many of them are poorly soluble in water and are distilled from solutions in the form of crystals. When the levels of [oxalate](#) in food are high, there is a risk of developing liver stone disease. MSU-based scientists created a highly sensitive material that can identify the presence of harmful ions even if their concentration is four times lower than the allowed maximum level.

The new sensor is a modified silicon-titanium gel deprived of its liquid phase. The material looks like purple powder consisting of about 100 nm-sized particles. The structure of the gel also includes eriochrome cyanine, an indicator that loses its colour after contacting any substance containing oxalate ions. Titanium included into the matrix of the sensor material can form stable colourless compounds with oxalate ions, causing coloured complexes with eriochrome cyanine to disintegrate and the material to lose colour. The scientists used a Lambda 35 spectrophotometer to measure the intensity of the sensor material colouring indicating the concentration of ions.

To obtain this sensor material, the scientists used the sol-gel technology. First, a solution with insoluble particles (1 to 100 nm) is prepared, and

then the liquid phase is removed. After the removal of liquid, solid molecules start building up new bonds, and the 3-D molecular matrix assembles. After the synthesis process was completed, the scientists added eriochrome cyanine to it.

"To identify oxalate ions in biological liquids in urine, we need to create a sensor material with higher sensitiveness. This is the goal of our follow-up studies," says Elena Morosanova, the author of the study and professor at the department of analytical chemistry of the Faculty of Chemistry, MSU.

The scientists selected five samples of food products as test samples—dock leaves, spinach leaves, parsley, ground black pepper and ginger root. The content of oxalate ions in these samples was determined in two ways: using the sensor material, and highly efficient liquid chromatography. The method showed almost similar results with the difference amounting to less than 10 percent.

"Our sensor material helps determine the presence of oxalate ions in food products—simply, quickly, and off the lab," added Elena Morosanova.

More information: Determination of Food Oxalates Using Silica–Titania Xerogel Modified with Eriochrome Cyanine R, *Sensors* (2018). [DOI: 10.3390/s18030864](https://doi.org/10.3390/s18030864)

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