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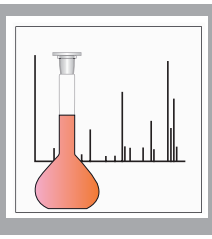

Highlights of Analytical Chemistry in Switzerland

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Optical Detection of Endogenous Biological Cyanide

Felix Zelder* and Christine Männel-Croisé

*Correspondence: Dr. F. Zelder, Institute of Inorganic Chemistry, University of Zürich, Winterthurerstrasse 190, CH-8057 Zürich
Tel: +41 44 63 546 24, Fax: +41 44 63 568 02, E-mail: zelder@aci.uzh.ch

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Cyanide poisoning is well known from its murderous role in detective stories as well as from the warning labels shown on cigarette packets since October 2003.

However, it is generally unknown that cyanide in common foodstuff exhibits a daily life problem for hundreds of million of people in developing countries and continues to cause severe acute and chronic health problems. Cyanide is stored in the form of cyanogenic glycosides in more than 2000 plants such as flax seeds, bamboo or cassava and is enzymatically released after cell disruption. Cassava (*Manihot esculenta* Crantz) is one of the most popular staple foods in Africa.

For instance, in Mozambique, which is one of the poorest African countries, cassava roots are mainly produced for rural householders' consumption and sold at local markets (680 g per day and capita). Notably, the bitter cassava varieties with cyanide concentrations of up to 2.4 g/kg are widely used due to their natural defense mechanism against animal predation. Certain regions still suffer from cyanide poisoning as a consequence of non-adequately processed cassava roots.

It is astonishing that a cheap, easy-to-understand, fast and reliable test that is available to anyone is still lacking. Optical sensors that do not need expensive instrumentation are very attractive for these purposes. The research in our group focuses on the development of optical chemosensors for cyanide on the basis of vitamin B12 derivatives consisting of a corrin macrocycle with a central cobalt ion for cyanide binding. In the presence of cyanide, the cobalt-coordinated water is replaced by a cyanide anion inducing a color change from orange to violet. With this methodology in hand, the selective detection of cyanide below the guideline value of the U.S. Environmental Protection Agency of 0.2 mg/l was rendered possible by 'naked-eye' detection. Recently we demonstrated for the first time the detection of endogenous cyanide directly in biological matrices; we were able to follow the enzymatic release of cyanide in real-time directly on a biological surface using diffuse reflectance spectroscopy (DRUV-vis). **We envisage that this methodology will find further applications and will help to improve food safety control of cassava products in developing countries.**

Selling of dried cassava on a street in Zambeze Provinze/ Mozambique (courtesy of Lucas Tivana).

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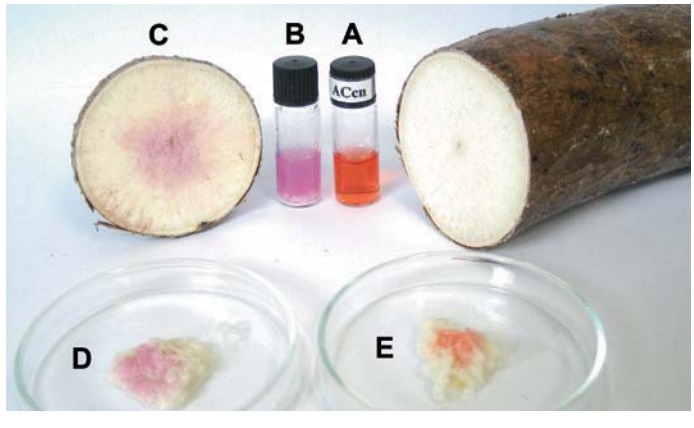
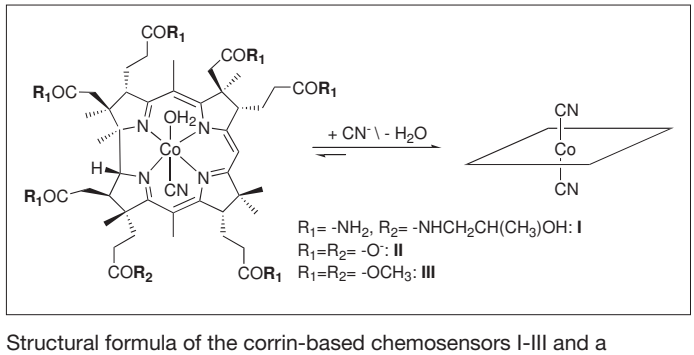


The orange corrin-based chemosensor (A) turns violet in the presence of cyanide, as in an aqueous solution of crude cassava (B), a freshly sliced cassava surface (C) or a ground cassava extract (D). No cyanide is detected after thorough washing of the ground cassava extract (E).



Structural formula of the corrin-based chemosensors I-III and a schematic representation of cyanide detection (right).

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Please contact: Dr. Veronika R. Meyer, EMPA St.Gallen, Lerchenfeldstrasse 5, 9014 St.Gallen
Phone: 071 274 77 87, Fax: 071 274 77 88, Mail to: veronika.meyer@empa.ch