Spectroscopic identification of mycotoxins in cereals

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Mycotoxins are toxic fungal metabolites that may contaminate primary food products such as cereals, nuts and fruits. The most predominant mycotoxins in Europe among others are the *Aflatoxins* and *Ochratoxins* produced by storage fungis, such as *Aspergillus* and *Penicillium* species, and mycotoxins formed by field-borne *Fusarium* species, for example *Zearalenone* and *Deoxynivalenol*. [1]

Because of the potential health hazards for humans the monitoring of food and feed for the presence of mycotoxins is of utmost importance. Therefore, an urgent need for reliable, low-cost and easy-to-use experimental setups exists. Legislation guidelines regarding the allowed levels of mycotoxins in food and feed products as well as in raw materials are presented by the FAO, updated in 2003. [2] A reliable and sensitive in-situ detection of fungi contamination and of mycotoxins in the raw materials at the beginning of the food production chain is indispensable in order to increase food and feed safety to the standards required.

The use of spectroscopic methods in food control and food monitoring is increasing rapidly, in particular in combination with chemometric tools. Non-destructive methods, such as absorption, fluorescence and reflection spectroscopy, are powerful methods for the detection of mycotoxins in solution and on the surface of grains and flour. The introduction of fiber-based chemical sensors might further accelerate the application of spectroscopic methods in the field of feed and food control along the food production chain. [3]

Because of its outstanding sensitivity fluorescence spectroscopy based techniques are especially suited for the in-situ detection of mycotoxins such as *Ochratoxins*, *Aflatoxins* as well as *Zearalenone*. These mycotoxins can be monitored with an excitation in the spectral range of 200 nm < λ_{ex} < 400 nm and a detection wavelength λ_{em} > 420 nm. In combination with absorption and reflection measurements, qualitative and quantitative information on the mycotoxins present can be obtained. In addition, NIR reflection spectra yield further information on the ingredients, the moisture content, and the presence (or absence) of fungi in the sample. [4, 5]

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[1] EMAN - European Mycotoxin Awareness Network (www.mycotoxin.org)

[2] FAO, Worldwide regulations for mycotoxins in food and feed in 2003; *FAO Food and Nutrition Paper 81*, **2004**

[3] S. Panigrahi; G. Zhang, U.S. Patent 6 845 326, **2005**

[4] G.M. Strasburg, *Trends in Food Science & Technology*, **1995**, *6*, 69-75

[5] (a) Williams, P.; *Handbook of Vibrational Spectroscopy* (edited by P. Griffiths, J.M. Chalmers), Wiley & Sons, New York, **2006**; (b) G. Downey, *Journal of Near Infrared Spectroscopy*, **1996**, *4*, 47-61