

## Advancement of Microtiter Plate with Integrated Optical Glucose Sensing Feature for Applications in Life-Science

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### Abstract

The employment of microtiter plate for screening applications such as enzyme-immunometric assay or toxicity test are widely used.<sup>1)</sup> Compared to other methods microtiter plates offer the advantages of small sample volume and simultaneous screening of high numbers of samples. In this work we describe the development of a glucose sensing microtiter plate based on the glucose oxidase (GOD) catalyzed oxidation. During this reaction oxygen is consumed making an indicator for glucose. As transducer the fluorescent ruthenium phenylphenanthroline complex was employed whose fluorescence changed in dependence on the ambient oxygen concentration. This so called quenching effect is caused by the interaction of the fluorophor molecule and molecular oxygen leading to a energy transfer from the excited dye molecule to the oxygen molecule. The consequence is a deactivation of the dye so that it cannot fluoresce. This phenomenon is described by the Stern-Volmer-Equation.<sup>2)</sup> In our microtiter plate the sensing layer was implemented on the bottom of the wells. It consisted of two single layers, one embedded an oxygen sensitive fluorophor and the upper layer carried the immobilized glucose oxidase. Both layers were made of organic sol-gels. The fluorescence intensity was measured by the plate reader Wallac Victor 2 (exc. shortpass filter 485nm/ emission longwave filter. 585nm) The sensing layer showed fast response time, high repeatability and sensitivity. It has a linear range within  $5\text{mmol}\cdot\text{l}^{-1}$ , the signal's 50% value was already detected within 2 seconds.

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### References

- 1) H.Ukeda,\* M. Ohira, A. K. Sarker & M. Sawamura, (1998), *Food Research International*, 31(4): 297-302.
- 2) KEES MAHUTTE, (1998), *Clinical Biochemistry*, 31(3):119-130.
- 3) John C. Pickup, Faeiza Hussain, Nicholas D. Evans and Nabihah Sachedina, (2005), *Biosensors and Bioelectronics*, 20(10): 1897-1902.