

# Focus on IFA's work

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## The use of luminous bacteria for the assessment of air quality

### Problem

An important function of occupational health and safety is the identification, assessment and monitoring of hazardous substances in workplace atmospheres. This function is normally fulfilled by chemical analysis of a substance or selected number of substances for the monitoring of atmospheric limit values. Due to its complexity and unknown interactions assessment of the total toxicity of the substance mixture actually present is seldom possible by this means.

### Activities

A standardised environmental toxicity test developed for the monitoring of water quality was adapted to the specific requirements of assessment of workplace atmosphere samples. Sampling can be performed in the usual way by means of air sampling adsorbents and the toxicity determined in a central laboratory.

Bacteria of marine origin with the characteristic of bioluminescence ("cold light") are employed as biological sensors. Contact with toxic substances results in an inhibition of light emission, which in turn can be quantified by suitable instruments and constitutes a measure of the total toxicity of a test substance.

### Results and Application

The measurement method has proved effective in laboratory-scale testing involving defined test



Luminous bacteria on a Petri disk

gases (discrete substances) in the order of magnitude of the maximum workplace concentrations. The method was employed routinely in test-chamber experiments for the study of emissions from colour laser printers and colour photocopiers under realistic conditions. Trials were also performed successfully during the hot application of bitumen in field tests at real-case workplaces.

In the case of lipophilic (fat-soluble) substances the luminous bacteria test appears to be of somewhat restricted efficacy. It responds with disproportionate sensitivity to this class of substances, which limits the scope for its use.

### Area of Application

Employers, inspectors, measuring engineers

### Additional Information

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- Nies, E.; Blome, H.; Brüggemann-Priesshoff, H.: Charakterisierung von Farbtonern und Emissionen aus Farbfotokopierern/Farblaserdruckern. Gefahrstoffe – Reinhalt. Luft 60 (2000) No. 11/12, pp. 435-441
- Steinhausen, M.; Brüggemann-Priesshoff, H.; Gehrke, T.; Kießling, M.; Nies, E.: Beurteilung der Toxizität luftgetragener Stoffe am Arbeitsplatz mittels Leuchtbakterientest. Teil 2: Kritische Bilanz. Gefahrstoffe – Reinhalt. Luft 70 (2010) No. 11/12, pp. 455-463

### Expert Assistance

IFA, Division 1: Information technology – Risk management

### Literature Requests

IFA, Zentralbereich