

CALUX[®] by BDS - Testing for PCBs

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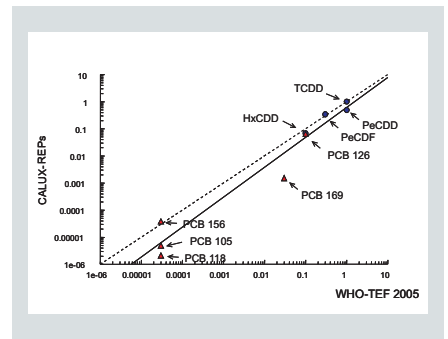
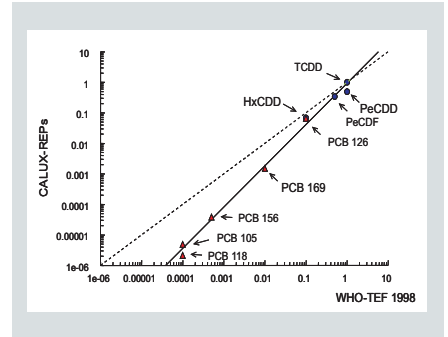
Introduction

Environmental safety is a high priority issue for the chemical industry and governmental regulators nowadays. In case of sediments in the Netherlands are very strict guidelines for the DR CALUX[®] Toxicity with 50 ng TEQ/kg d.w are used in routine¹. In Norway a dioxin-like compound toxicity guideline has been proposed measured by DR CALUX[®] or EROD at a level of 25 ng TEQ/kg d.w. for sediment toxicity².

The use of bioassays, like the DR CALUX[®] system for monitoring dioxin-like PCBs, allows the (pre)-selection of samples suspected of being contaminated above limit values or more risk full in environmental monitoring. BDS' various CALUX[®] bioassay systems are used for screening of chemicals such as dioxins and dioxin-like PCBs (DR CALUX[®]), endocrine disrupting chemicals (ER CALUX[®]) and sport doping or steroid hormones (AR CALUX[®]) in a wide variety of matrices (e.g. sediments, feed/food and human tissue/blood/urine).

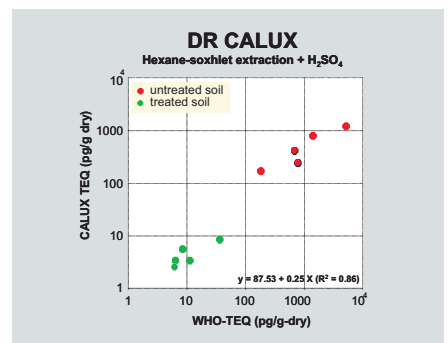
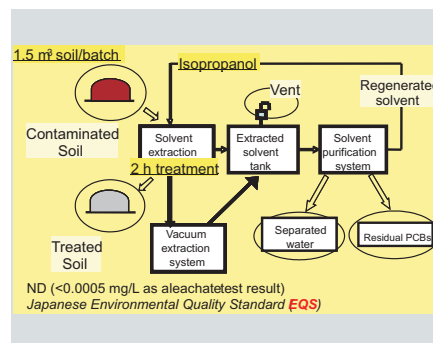
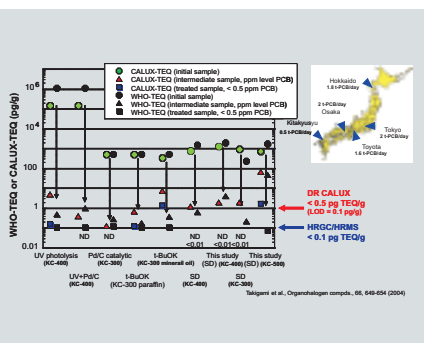
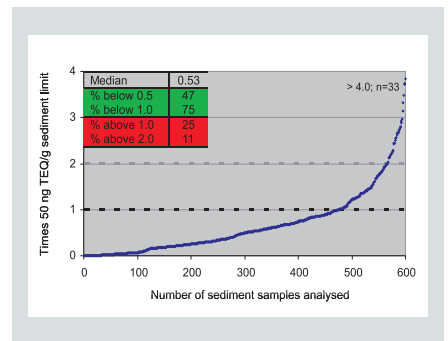
Although the overall comparison of DR CALUX[®]-derived REPs with the 2005 WHO-TEF values are good, some consistent differences in PCBs-REP values have been observed³⁻⁶. The correlation between DR CALUX[®] analysis results and GCHRMS analysis results improves when applying the new 2005 WHO-TEF values rather than the 1998 WHO-TEF values.

Within the last decade the service laboratory of BioDetection Systems has analyzed all kinds of sediments by DR CALUX[®] method for Total TEQ. The DR CALUX[®] analysis results of 634 sediment samples are presented and evaluation of results show that 25% of the tested samples would exceed the Dutch guidelines. In the present paper, the results of treatment of contaminated soil to reduce the PCB content, is presented.



PCDDs / PCDFs Structure	WHO-TEF 1998	WHO-TEF 2005	CALUX [®] REP	PCBs Structure	WHO-TEF 1998	WHO-TEF 2005	CALUX [®] REP	
Dioxins				Non-ortho				
2,3,7,8-TCDD	1	1	1	3,3',4,4'-tetraCB	PCB-77	0.0001	0.0001	0.0013
1,2,3,7,8-PeCDD	1	1	0.54	3,4,4,5-tetraCB	PCB-181	0.0001	0.0003	0.0001
1,2,3,6,7,8-HxCDD	0.1	0.1	0.3	3,3',4,4,5-pentaCB	PCB-126	0.1	0.1	0.067
1,2,3,7,8,9-HxCDD	0.1	0.1	0.14	3,3',4,4,5,5-hexaCB	PCB-169	0.01	0.03	0.0034
1,2,3,7,8,9-HxCDF	0.1	0.1	0.066	Mono-ortho				
1,2,3,4,6,7,8-HpCDD	0.001	0.01	0.05	2,3,3',4,4'-pentaCB	PCB-105	0.0001	0.00003	0.000012
OCDD	0.0001	0.0003	0.0001	2,3,4,4,5-pentaCB	PCB-114	0.0005	0.00003	0.000048
Furans				2,3,4,4,5-pentaCB	PCB-118	0.0001	0.00003	0.0000073
2,3,7,8-TCDF	0.1	0.1	0.32	2,3,4,4,5-pentaCB	PCB-123	0.0001	0.00003	nd
1,2,3,7,8-PeCDF	0.05	0.03	0.21	2,3,3',4,4,5-hexaCB	PCB-156	0.0005	0.00003	0.00021
2,3,4,7,8-PeCDF	0.5	0.3	0.5	2,3,3',4,4,5-hexaCB	PCB-157	0.0005	0.00003	0.00008
1,2,3,4,7,8-HxCDF	0.1	0.1	0.13	2,3,4,4,5,5-hexaCB	PCB-167	0.00001	0.00003	0.00001
1,2,3,6,7,8-HxCDF	0.1	0.1	0.39	2,3,3',4,4,5,5-heptaCB	PCB-189	0.0001	0.00003	0.0001
1,2,3,7,8,9-HxCDF	0.1	0.1	0.11					
2,3,4,6,7,8-HxCDF	0.1	0.1	0.18					
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.032					
1,2,3,6,7,8,9-HpCDF	0.01	0.01	0.041					
OCDF	0.0001	0.0003	0.0001					

vd Berg et al., 1998; vd Berg et al., 2006; Hosoe et al., 2002



Conclusion

1. Differences in WHO-TEF and DR-CALUX[®]-REP values for dioxin-like PCBs are described.
2. A good correlation between HRGCMS-derived TEQ vs DR CALUX[®]-derived TEQ exist.
3. For the 634 sediments samples evaluated here, 25% exceeded the Dutch guideline for sediments of 50 ng TEQ/kg dry weight

References

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