

**WEACAU-III: International Workshop on
Environmental Aspects of Coal Ash Utilization**

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**European regulatory developments – standardization and
approaches**

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Abstract

The environmental aspects of beneficial use of alternative materials in construction is high on the Europe Union agenda. This includes materials already used beneficially for some time, like coal fly ash. The interest in this topic is driven by current regulatory developments. For example, Essential Requirement 3 of The Construction Products Directive (CPD, 1988) addresses health and environmental aspects of service life of construction products. After the preparation of technical specifications covering the technical and physical aspects of use, the paragraph on environment and health needs to be filled. The development of appropriate standards has been taken up by CEN/TC 351(2011), where a horizontal approach to testing is promoted to avoid multiplication of test protocols per sector, which would lead to a lot of unnecessary duplication of work. The robustness validation of two test methods relevant to impact to soil and groundwater is expected to be finalized in the second half of 2012. Early 2011 the Construction Products Regulation (CPR, 2011) has been adopted, which is expected to replace the CPD by 2013. This regulation not only addresses service life, but extends in scope to recycling and end of life aspects.

Recycling and end of life of materials generally implies size reduction and more exposure to the atmosphere, making carbonation an important aspect to consider. The pH dependence test is ideally suited to anticipate release behavior under such conditions, which would imply adding this test to the toolbox of test methods adopted by CEN/TC351. The activities of IPTS-JRC in relation to the development of criteria for End of Waste (EoW, Delgado et al 2010) are closely related to these developments. The approaches and testing requirements shall ensure that redundant testing is avoided.

Recent developments in the European Hazardous Waste regulation dealing with hazard properties of waste may have undesired implications for coal fly ash. One of the aspects addressed in this regulation is the use of ecotox testing of wastes, which is disputed because the interpretation of test results lacks balance with other types of evaluation.

In the framework of the CPD dossiers are drafted to allow declarations of Without Further Testing (WFT, 2011) for products as a whole, or for specific regulated substances released from products, when a product can be shown to meet regulatory criteria in all its intended uses. These dossiers call for information and test data on the

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wide variety of products covered by the CPD. As regulations for construction products are in place in a few EU member states (Dutch SQD, 2007; LAWA, 2004; BMU, 2012), experience has been gained with a range of products over the years. This information needs to be more readily available to end-users. This is where LeachXS™ Lite (available free of charge at www.vanderbilt.edu/leaching) can play a role, which has been developed with support of US EPA for use in combination with the new leaching test methods (US EPA 1313-1316, Garrabrants et al 2012a and b) now included in SW846 (book of EPA official test methods). In the development of the full Leaching Expert System - LeachXS™ a database has been developed that can handle almost any type of laboratory leaching test, lysimeter or other larger scale controlled test as well as field data. The database also covers test data on organic contaminants and radionuclides. Already a substantial amount of data has been gathered by the developers, which can be aggregated into statistically treated data that can be used as benchmarks for different materials types. For coal fly ash, in particular, a very extended data set is available (www.vanderbilt.edu/leaching).

Regulatory criteria

In Europe criteria exist for the EU Landfill Directive. There are no European limits for construction products. That topic is as yet regulated at national level. In the Netherlands regulations are in place since 1995 (Building Materials Decree) and updated in 2007 (Soil Quality Decree). In Germany no formal regulatory criteria exist although discussion is ongoing for some time now. The quality objectives to be met are not too different from the Dutch, but the impact assessment is very different, which leads to significantly different outcome for the release as obtained in tests to be met. Since organic substances are of no concern for coal fly ash only inorganic substances are listed in the tables below.

Dutch Soil Quality Decree criteria

The criteria in the table below relate to release to be met in a leaching test in either mg/kg (granular materials) or mg/m² (monolithic products). These values were derived from generic impact modeling taking groundwater quality and soil quality objectives into account, which are derived on the basis of ecotoxicological criteria.

Table I. Release limits for construction products as defined in the SQD (2007)

Parameter		Monolith	Granular material	Isolated application
		E _{64d} in mg/m ²	mg/kg d.m.	mg/kg d.m.
Antimony	(Sb)	8.7	0.16	0.7
Arsenic	(As)	260	0.9	2
Barium	(Ba)	1.5	22	100
Cadmium	(Cd)	3.8	0.04	0.06
Chromium	(Cr)	120	0.63	7
Cobalt	(Co)	60	0.54	2.4
Copper	(Cu)	98	0.9	10
Mercury	(Hg)	1.4	0.02	0.08
Lead	(Pb)	400	2.3	8.3

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Molybdenum	(Mo)	144	1	15
Nickel	(Ni)	81	0.44	2.1
Selenium	(Se)	4.8	0.15	3
Tin	(Sn)	50	0.4	2.3
Vanadium	(V)	320	1.81	20
Zinc	(Zn)	800	4.5	14
Bromide	(Br)	670	20	34
Chloride	(Cl)	110000	616	8800
Fluoride	(F)	2500	55	1500
Sulfate	(SO ₄)	165000	1730	20000

German draft regulations for water quality objectives to be met

The values in the table below are concentrations to be met at the target for compliance in groundwater using an impact evaluation scenario. Proposed impact scenarios provide limit values to be used in connection with the leaching test methods.

Table II. Inorganic parameters.

<i>Anorganische Parameter</i>	<i>Geringfügigkeitsschwellenwert (µg/L)</i>
Antimon (Sb)	5
Arsen (As)	10
Barium (Ba)	340
Blei (Pb)	7
Bor (B)	740
Cadmium (Cd)	0.5
Chrom (Cr III)	7
Kobalt (Co)	8
Kupfer (Cu)	14
Molybdän (Mo)	34
Nickel (Ni) 14	14
Quecksilber (Hg)	0.2
Selen (Se)	7
Thallium (Tl)	0.8
Vanadium (V)	4
Zink (Zn)	58
Chlorid (Cl ⁻)	250 mg/l
Cyanid (CN ⁻)	5 (50)
Fluorid (F ⁻)	750
Sulfat (SO ₄ ²⁻)	240 mg/L

Details on these regulations can be found in the referenced publications.

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