

## Waste Water Monitoring in Akouedo/Abidjan, Cote d'Ivoire with Gaiasafe Passive Collectors (PC)

Rainer Haas<sup>1,2</sup>, Cynthia Sie<sup>2</sup>, Alfred Krippendorf<sup>1</sup>, Fritz Pfeiffer<sup>1</sup>

1: Büro für Altlastenerkundung und Umweltforschung, Stadtwaldstr. 45a, D – 35037 Marburg

2: BFAU – Office Abidjan, Riviera III, Cite EECI, Villa No. 314, Abidjan, Cote d'Ivoire

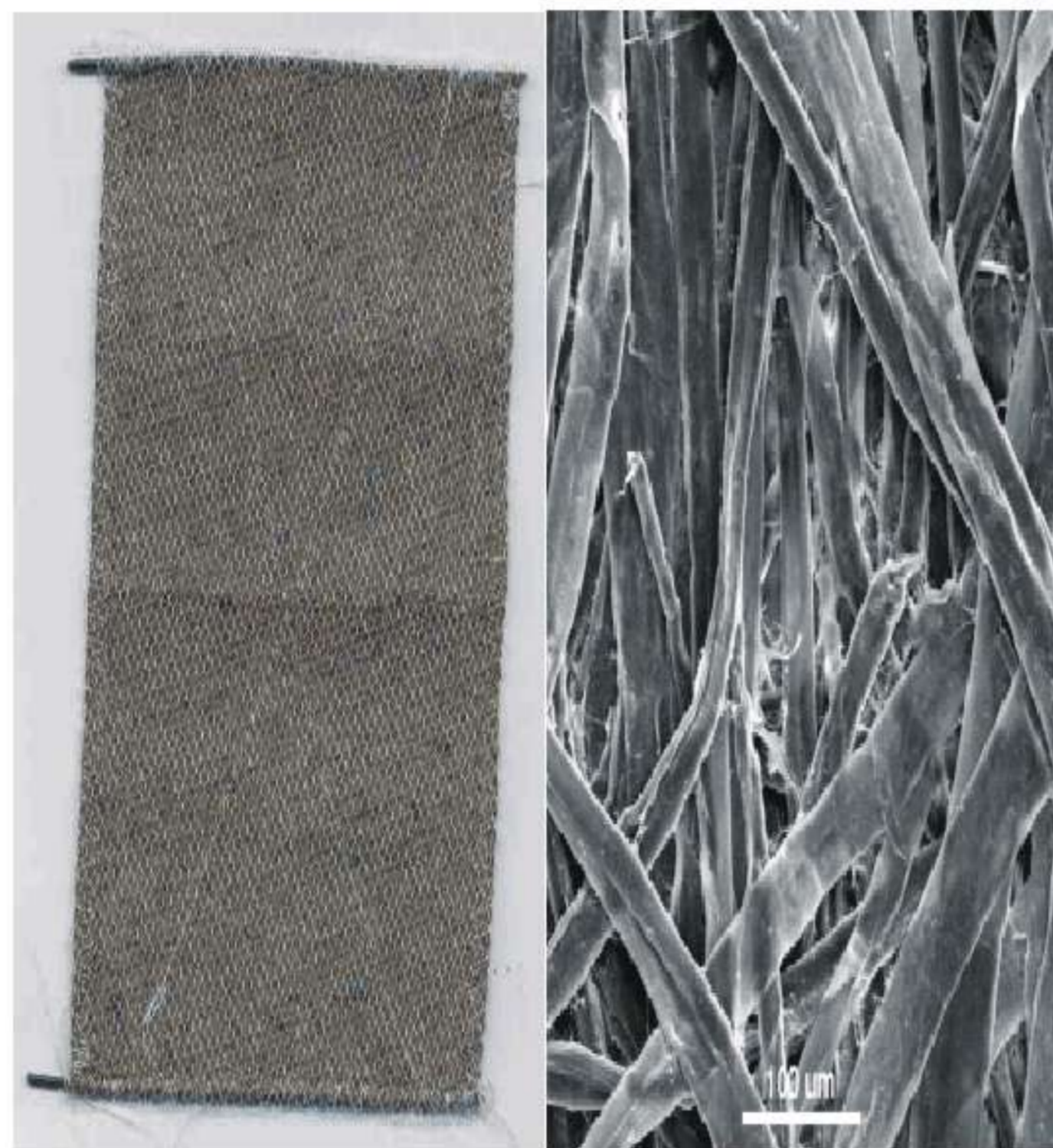
3: Hazard Control GmbH, Versuchsfeld Trauen, D – 29328 Fassberg

### General

The Gaiasafe Passive Collector (PC) consists of a paper arrangement of different active sorption fibres. This PC's are capable of collecting all organic compounds, heavy metals and metalloids and can be used in all environmental settings.

The PC's are suited for surface and ground water monitoring, with an effective collection time interval of 1 to 8 weeks, depending on the amount of present contaminations.

Application of PC yields the medium load contamination during the collecting time. Field use, handling and transfer of PC samples are very simple. After their use, the PC's are dried and stored in suitable shipping containers. The low item weight of 2.7 grams enables easy shipment even from remote sites.



### Summary

Contamination load and distribution of contaminants was shown. Gaiasafe Passive Collectors have been used successfully to determine single compounds out of the contamination load. Furthermore the spreading and biodegradation of contaminants was monitored over a large area.

The use of Gaiasafe Passive Collectors supports environmental monitoring effectively by its unique integral sorption capability. Direct contact of PC with water offer a close up and realistic view on the contamination load.



### Monitoring with Passive Collectors (PC)

Waste water monitoring with PC's was done in the Abidjan area during April 2006. Four sampling positions were chosen and monitored by the PC's for one week:

Lix 1: Black water directly at the waste disposal site

Lix 2: Black water 1 km downstream from the waste disposal site

Lix 3: Black water diluted by a small river

Lix 4: Lagoon at the mouth of the river.

At the end of August, liquid chemical waste were dumped illegally by the crew of Probo Koala, a tanker under Panamanian flag, on several sites in Abidjan, the Ivory Coast economic capital.

These substances are held responsible for the death of ten persons, and more than 100.000 medical consultations. Individuals affected suffered from diarrhoea, nausea or from blood discharge out of the upper ventilatory system.

In response to this particular incident two monitoring sessions were done at the station Lix 1 in September 2006:

Sample AC 1: Monitoring time 1.09.06 – 7.09.06

Sample AC 2: Monitoring time 25.09.06 – 3.10.06.

The PC's were dried onsite, subsequently transferred to Germany and subjected to laboratory examination. The preparation of the PC's was done as follows: samples were extracted with methanol and analysed with Gas Chromatography/Mass Spectrometry (GC/MS).



### Results

With GC/MS-analysis alpha-Pinen and D-Limonen were identified in all samples. The following compounds were identified additionally in the six samples:

#### a) Lix 1:

**PAK:** 2-Ethylacridine, Diisopropylnaphthaline, Tetramethyl-biphenyl

**Aromatic hydrocarbons:** Dimethylethylbenzene, Phenol, Methylphenol, 4,4'-Methylethylidenphenol

**Phthalates:** Ethylhexylphthalate.

#### b) Lix 2:

**PAK:** 2-Ethylacridine

**Aromatic hydrocarbons:** Dimethylbenzene, Dimethylethylbenzene, Trimethylbenzene, Methylphenol

**Phthalates:** Dibutylphthalate.

#### c) Lix 3:

**PAK:** 2-Ethylacridine

**Aromatic hydrocarbons:** Toluene, Trimethylbenzene.

#### d) Lix 4:

**PAK:** 2-Ethylacridine

**Aromatic hydrocarbons:** Toluene, Trimethylbenzene

**Phthalates:** Dibutylphthalate.

#### e) AC 1:

**PAK:** Indol, Diisopropylnaphthaline

**Aliphatic hydrocarbons:** Dodecane

**Aromatic hydrocarbons:** Toluene, Ethylmethylbenzene, Trimethylbenzene, Phenol, Methylphenol (3 Isomers), Dimethylphenol, Ethylphenol, 4,4'-Methylethylidenphenol

**Phthalates:** Methylpropylphthalate, Butyldecylphthalate, Dioctylphthalate.

#### f) AC 2/2:

**Aromatic hydrocarbons:** Toluene, Xylene, 4,4'-Methylethylidenphenol

**Phthalates:** Dipropylphthalate.

### Discussion

The result of the April monitoring (samples Lix 1 – Lix 4) shows dilution effects on the way downstream.

All the way down from the waste disposal site to the mouth of the river in the lagoon dilution and microbial degradation could be observed: only the PAK 2-Ethylacridine is present in all samples, other PAK and Phenols could be found in sample Lix 1 only.

In the tidal area of the lagoon Toluene and Trimethyltoluene were detected.

The effect of dumping the liquid chemical waste from Probo Koala at August 2006 was observed:

Sample AC 1 contained additional substances, mainly Indol, Dodecan, some Phenols and some Phthalates compared to the reference investigation in April 2006 (Lix 1).

Two weeks later (sample AC 2/2), the afore mentioned substances were no longer detectable.

The result shows, that the liquid chemical waste from Probo Koala was detected in the surface water only a few days after dumping. Two weeks later the specific substances were no longer detectable.

Passive Collectors are available from gaiasafe gmbh Marburg only at a pricing rate of 20 Euro per single item.