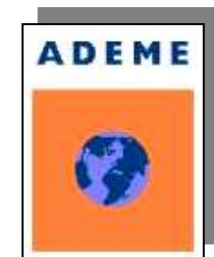


FieldTurf Tarkett™

UNITED WE STAND IN 2007

ENVIRONMENTAL ASSESSMENT (LEACHING AND GAS EMISSIONS) OF INFILLED SYNTHETIC TURF

RESEARCH SET UP BY A FRENCH LABORATORY (EEDEMS) IN PARTNERSHIP WITH THE FRENCH ENVIRONMENTAL AGENCY (ADEME), FIELDTURFTARKETT AND ALIAPUR (Association in charge of collecting old tires and their reuse)

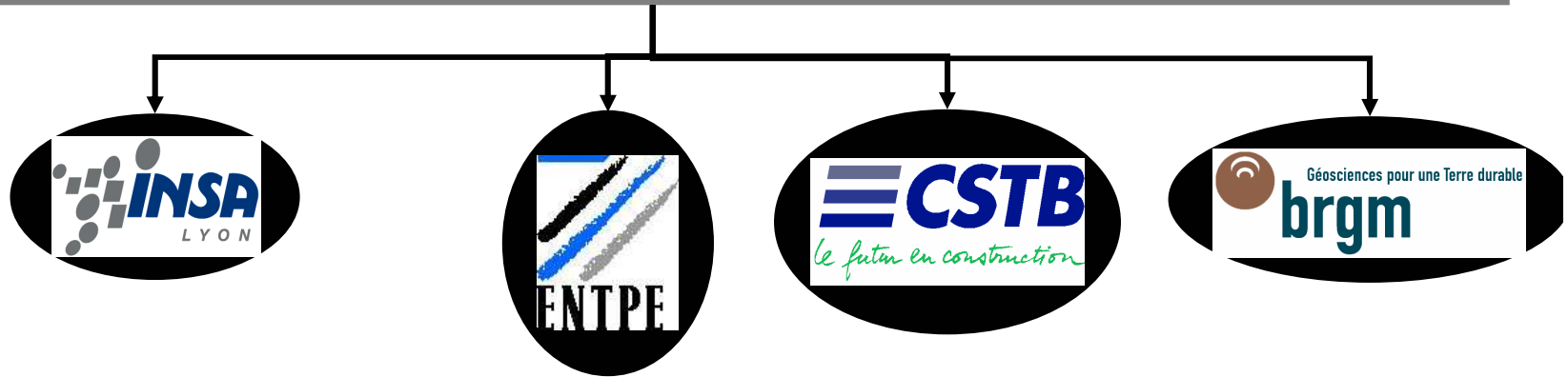


ENVIRONMENTAL AND HEALTH RISK STUDY FIELDTURF TARKETT

- This study has been carried out to achieve different goals :
 - Give scientific information regarding environmental impact of our systems
 - Bring scientific answers to people's questions on the market
 - Compare different infill materials to shut down polemics from competitors using EPDM and TPE
 - Give bases for new protocol measurements

EEDEMS: A SCIENTIFIC GROUP OF INTEREST SPECIALIZED IN RISK ASSESSMENTS FOR BUILDING APPLICATIONS USING RECYCLING MATERIALS

*French technological platform of environmental impact assessment of
water / polluted soils / materials*



4 publicly-owned establishments and 6 teams of research

Towards a pluridisciplinary consideration of eco-compatibility
and treatment and reuse networks life cycle

**EDEMS SET UP A COMPLEMENTARY APPROACH TO THE TESTS
STANDARDIZED IN LABORATORY IN ACCORDANCE WITH THE EN 12920
STANDARD AND THE WORK OF TC 351 (CONSTRUCTION)**

**Environmental and Health Assessments through the
study of :**

**A : Chemical and Ecotoxicologic analysis of water
passing through synthetic turf (following EN 12920)**

B :

**✓ VOC and Aldehydes emissions generated by
materials used in synthetic turf (following a new
protocol for construction products (TC 351))**

✓ Health risks according to several scenarios

MAJOR CONSTITUANTS OF STUDIED SYSTEM



**Synthetic Turf
product from the
FieldTurf Tarkett range**



**Sand washed
SIZE < 1 mm**



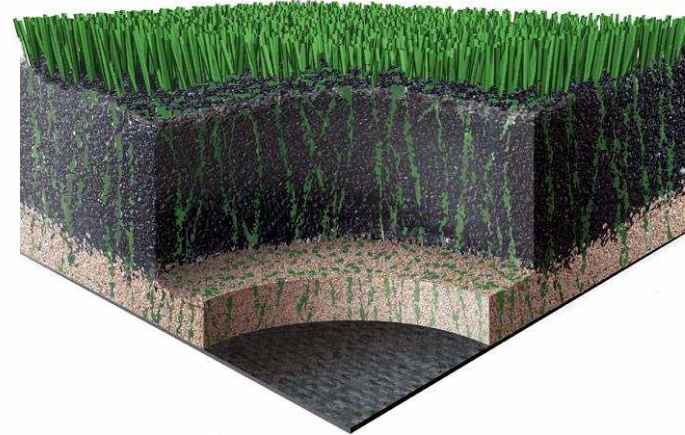
**Granulates (0,5 – 2
mm) : EPDM, TPE,
SBR**

**Synthetic seaming tape
and adhesive
polyurethane**



ENVIRONMENTAL ASSESSMENT OF SYNTHETIC TURF : LEACHING

1 – Fieldturf Tarkett Product



2 - Methods

- ✓ Two different approaches :
 - on site, with a real outdoor synthetic field, near LYON (France)
 - in an experimental room of EEDEMS Laboratory located in Lyon
- ✓ Two types of instrumentation :
 - on site, with a water collecting system implemented under the synthetic turf during the installation process
 - in the lab, with four experimental reduced scale synthetic turf pitches

INSTALLATION OF A WATER COLLECTING SYSTEM (LYSIMETER) UNDER REAL OUTDOOR SYNTHETIC TURF NEAR LYON



Installation of the water collecting unit



Adjustment of the levels



Water collecting system



Adjustment of the ground draining support

INSTALLATION OF SYNTHETIC TURF ABOVE THE WATER COLLECTING SYSTEM – RUBBER GRANULATES AS INFILL MATERIAL



Unfolding of a roll of synthetic turf



Installation of the roll of synthetic turf above the water collecting unit



Spreading and brushing SBR all over the field



Discharge of SBR to the top of the water collecting unit

CONSTRUCTION OF 4 REDUCED SCALE INDOOR SYNTHETIC TURF PITCHES, ARTIFICIALLY WATERED

Synthetic turf + TPE granules

Synthetic turf + EPDM granules

Watering systems, reproducing one year of rain (800 mm)

Synthetic turf + recycled rubber granules

Synthetic turf without infill



THE EXPERIMENTATION HAS BEEN RUNNING FOR 12 MONTHS WITH FREQUENTLY SAMPLING FOR ANALYSIS

- ✓ **On Site approach-Outdoor field**
 - **Beginning : October 2005**
 - **7 samples and analysis from October 2005 to October 2006 (depending on rain levels)**
 - **End of the experimentation : October 2006**

- ✓ **The 4 experimental Indoor reduced scale synthetic turf pitches**
 - **Beginning : November 2005**
 - **8 samples and analysis from November 2005 to October 2006 (after 15 days, 1, 2, 3, 6 months)**
 - **End :October 2006**

PHYSICOCHEMICAL ANALYSIS OF SAMPLES AND COMPARISON WITH LEGAL LIMIT VALUES

43 parameters analyzed :

- pH and conductivity
- Organics :
 - Total Hydrocarbons (THC)
 - Polycyclic Aromatic Hydrocarbons (16 PAHs)
 - Total Organic Carbon (TOC)
 - Phenol
- Metals : Al, Ba, Cd, Co, Cu, Mo, Ni, Pb, Sb, Se, Zn, As, Cr, Hg, Sn
- Fluorides, Chlorides, Sulfates
- Ammonium
- Nitrates

Compared to :

- Limit values as defined by the European Standards for non dangerous waste disposal
- Limit values according to the Classified Installation for Environmental Protection decree
 - The French Acceptance levels for drinkable water (decree 2001-1220)

RESULTS

A : Chemical and Ecotoxicological analysis of water passing through synthetic turf (according to EN 12920)

Results for chemical analysis

✓ pH and conductivity similar between outdoor collected samples and indoor pilot reduced scale fields

✓ Organics :

Very low concentrations measured for each component and always under limit values

Cyanides : < 60 µg/l

Phenol : < 20 µg/l

Hydrocarbon : < 50 µg/l

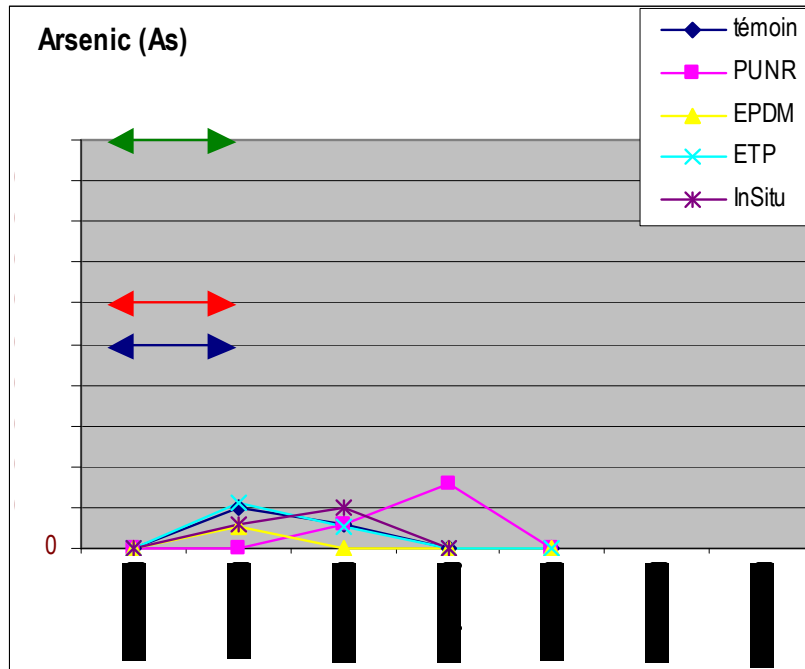
6 PAHs : < under detection limits

✓ Heavy Metals

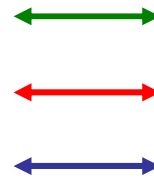
Very low concentrations measured for each component and always under limit values

✓ HEAVY METALS

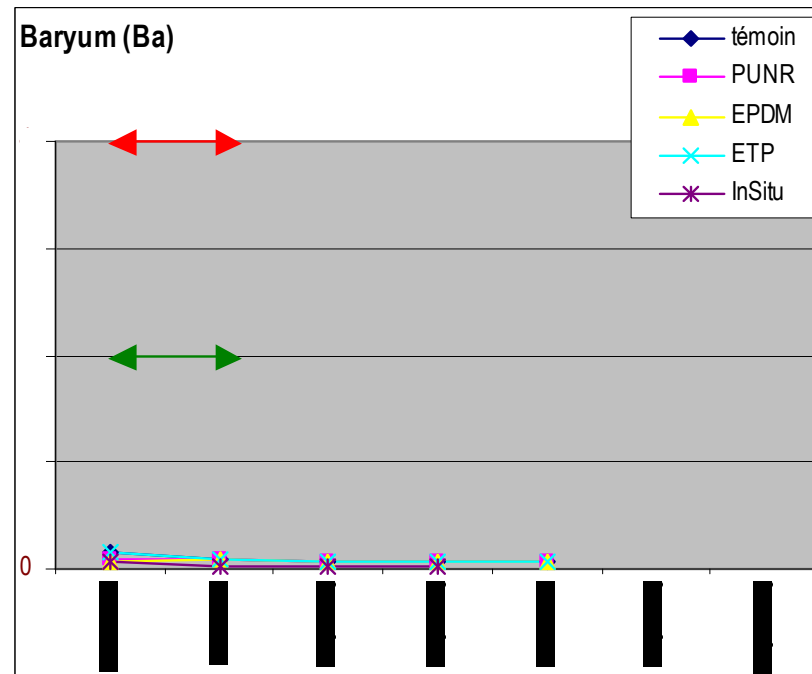
Arsenic



Limit of legal values



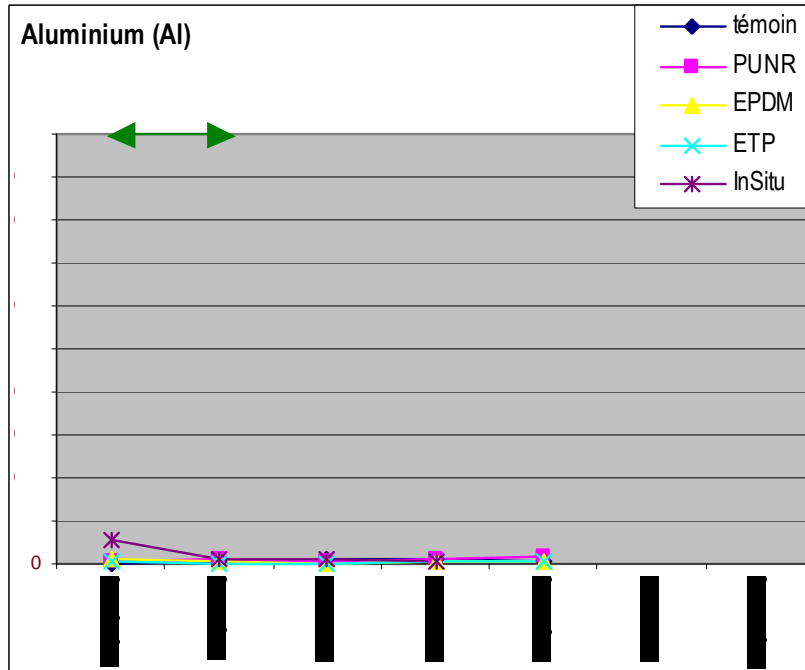
Barium



- ◆ Synthetic fibers
- Rubber granulates from tires
- ▲ EPDM granulates
- × ETP granulates
- * Rubber granulates (in situ)

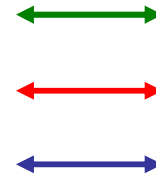
✓ HEAVY METALS

Aluminum

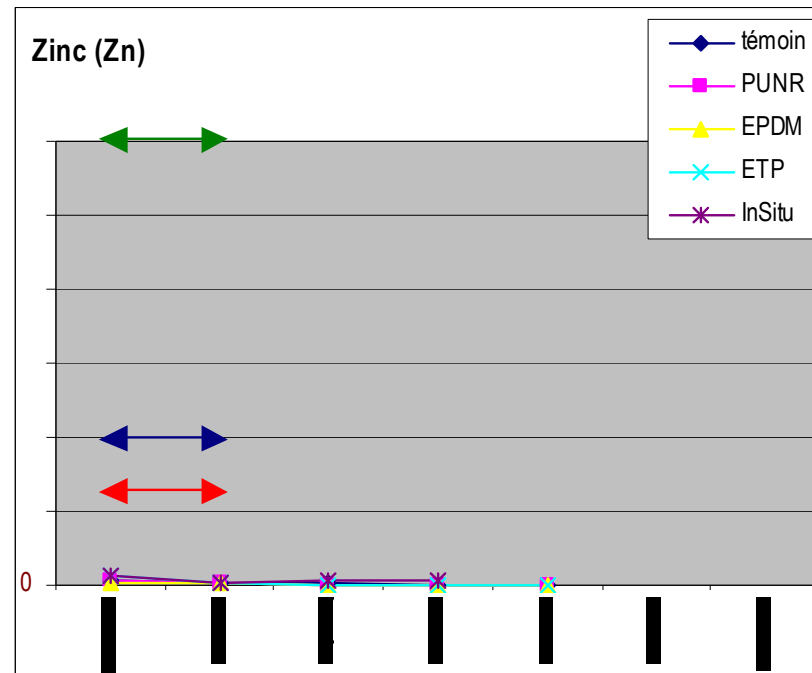


- ◆ Synthetic fibers
- Rubber granulates from tires
- ▲ EPDM granulates
- × ETP granulates
- * Rubber granulates (in situ)

Limit legal values

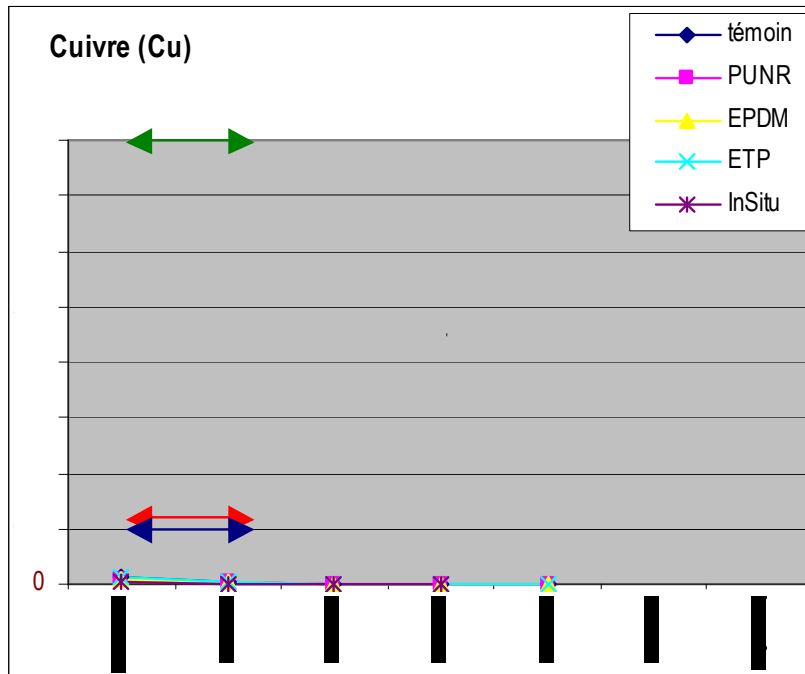







Zinc



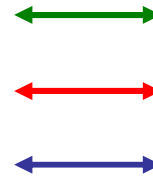
✓ HEAVY METALS

Copper

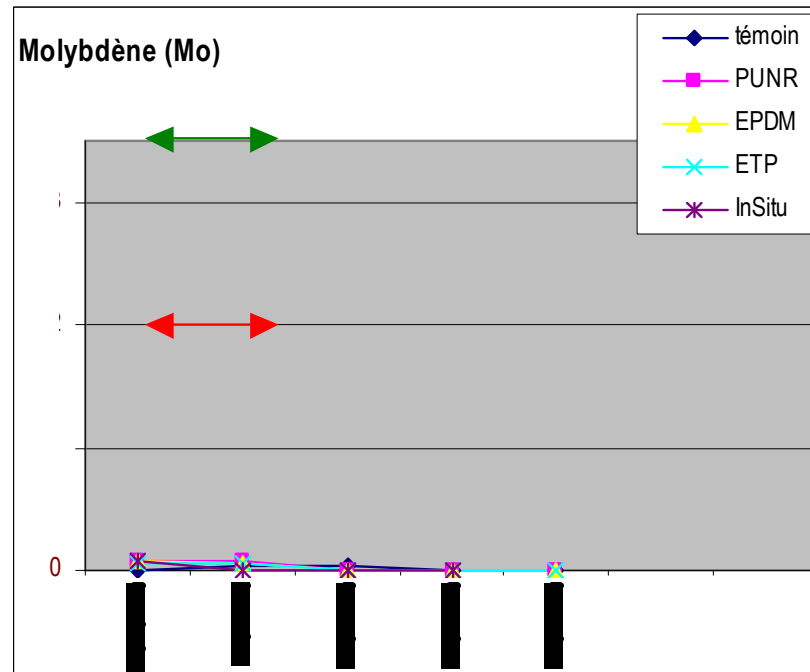


-  Synthetic fibers
-  Rubber granulates from tires
-  EPDM granulates
-  ETP granulates
-  Rubber granulates (in situ)

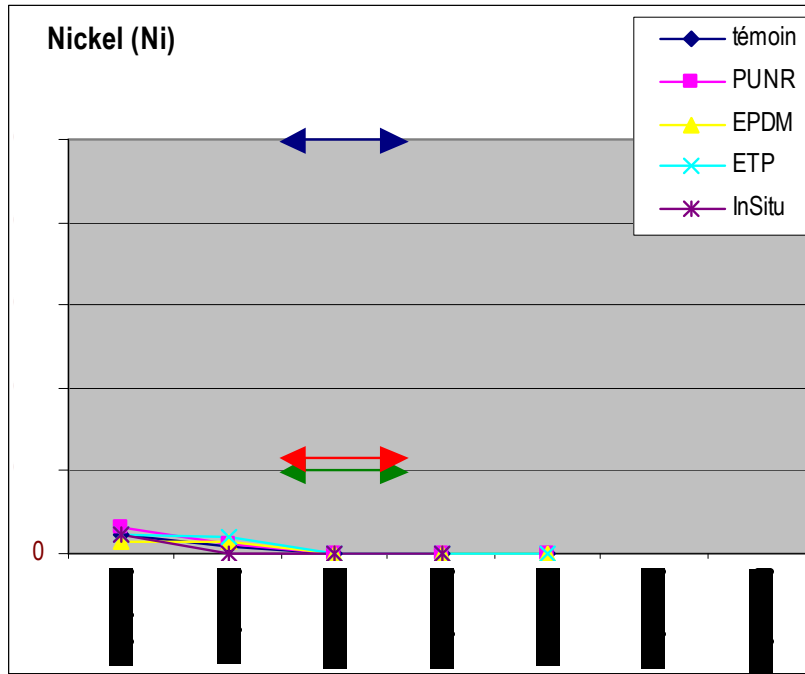
Limit legal values



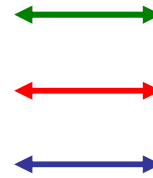
Molybdenum



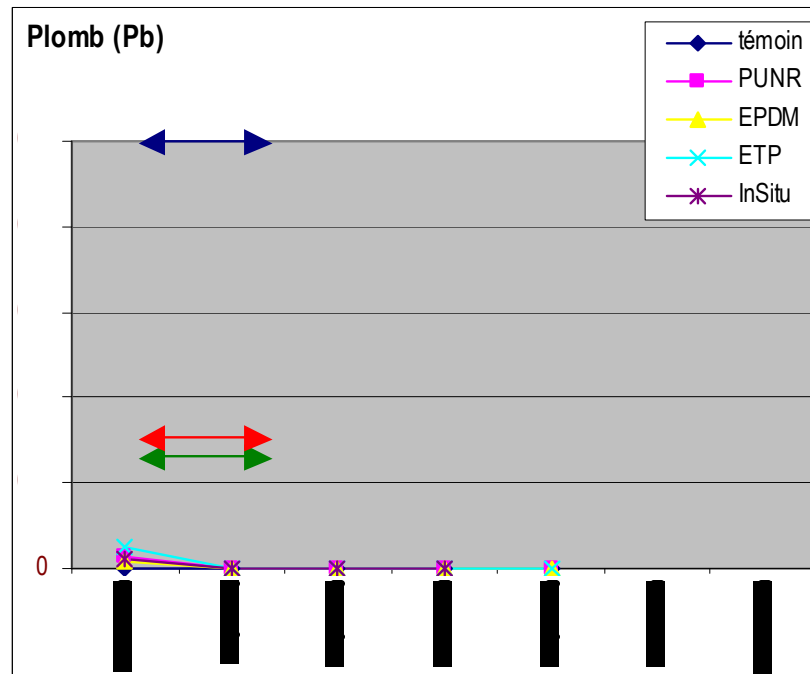
✓ HEAVY METALS








Limit legal values



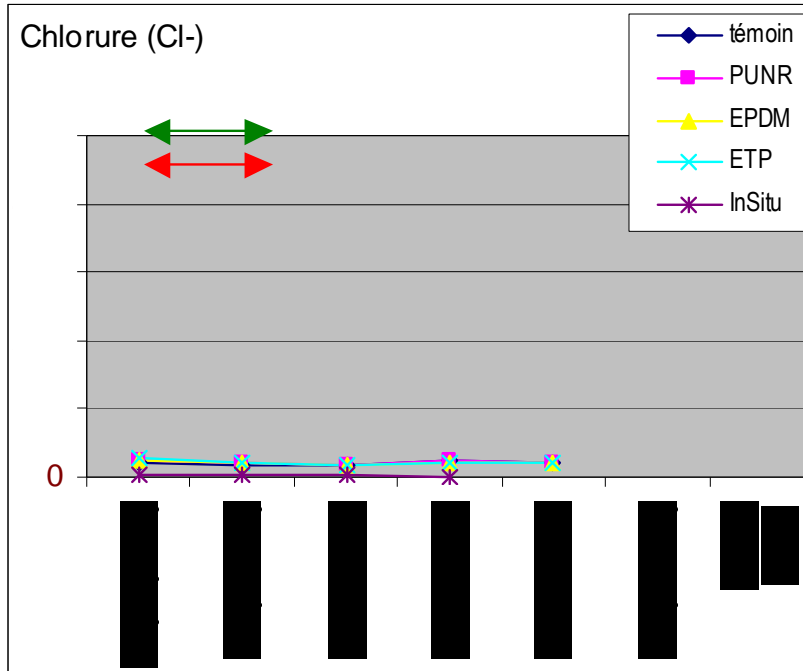
Plumbum



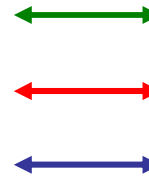
-  Synthetic fibers
-  Rubber granulates from tires
-  EPDM granulates
-  ETP granulates
-  Rubber granulates (in situ)

✓ Chlorites, Sulfates, Fluorites

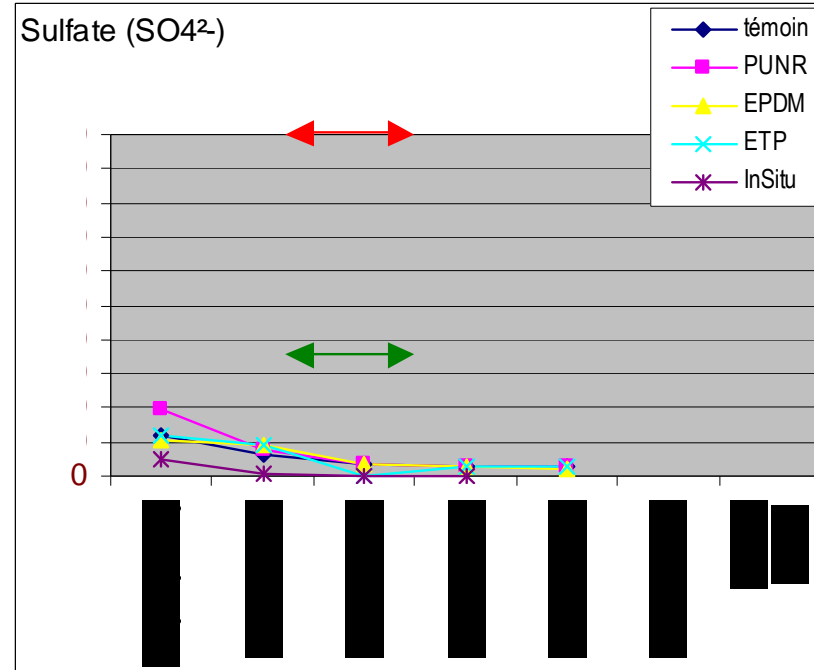
Chloride








Limit legal values

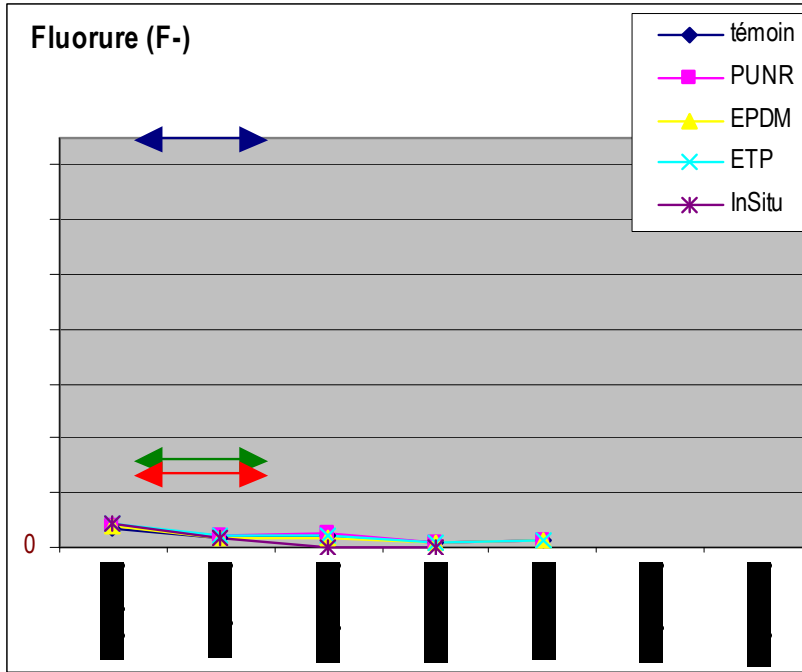


Sulphate








-  Synthetic fibers
-  Rubber granulates from tires
-  EPDM granulates
-  ETP granulates
-  Rubber granulates (in situ)

Fluoride



Limit legal values



-  Synthetic fibers
-  Rubber granulates from tires
-  EPDM granulates
-  ETP granulates
-  Rubber granulates (in situ)

✓ TOXICOLOGICAL TESTS

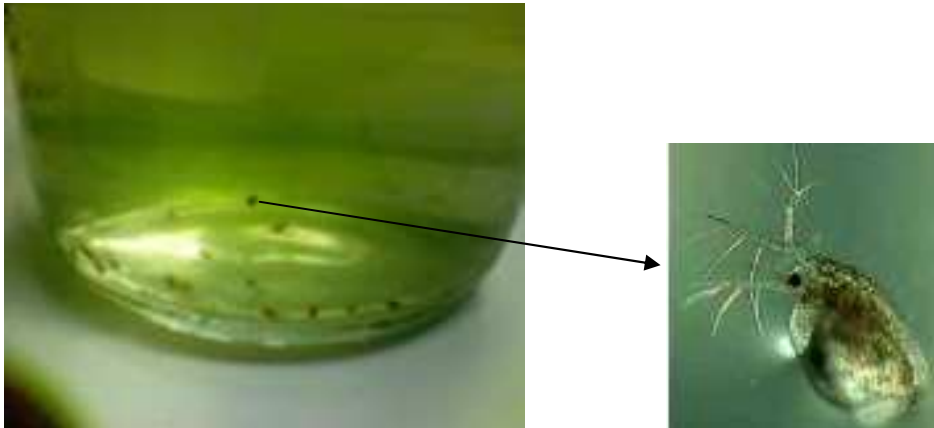
Determination of acute toxicity
(inhibition of the mobility of
Daphnia magna)



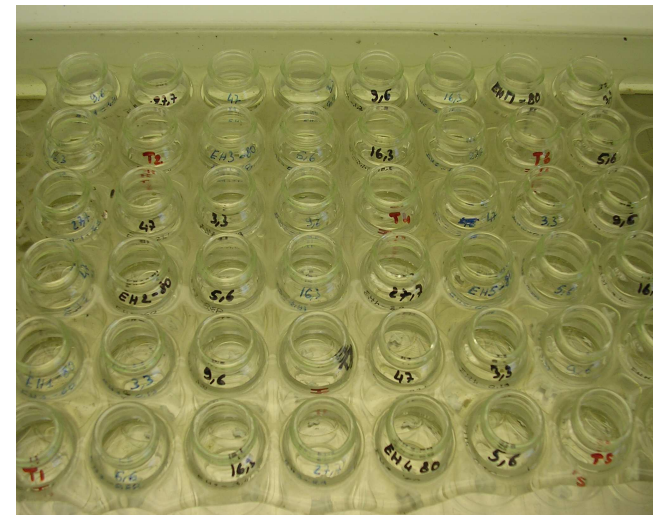
Evaluation of the chronic toxicity
(inhibition of the growth of the algae
Pseudokirchneriella subcapitata)

➡ No observed toxicity

➡ The value never exceeded the usual level of toxicity



No toxic answer observed in
acute (*Daphnia magna* 24h)



No toxic answer observed in
chronic (*P. subcapitata* 72h)

CONCLUSIONS OF THE LABORATORY

A : Chemical and Ecotoxicologic analysis of water passing through synthetic turf (following EN 12920)

- **Equivalent results** for all the different materials regarding legal levels :
 - For samples collected on the Outdoor synthetic pitch
 - For samples collected in the experimental room

- Concentrations in collected water are **always under the limit values and sometimes even under the detection limits.**

- **No observed toxicity**

Notice that the quantities of the tested materials are one hundred times more important in this study than in all existent studies (20 to 30 kg compared to 10 to 200 g) so as to offer the best representativeness

**EDEMS SET UP A COMPLEMENTARY APPROACH TO THE TESTS
STANDARDIZED IN LABORATORY IN ACCORDANCE WITH THE EN 12920
STANDARD AND THE WORK OF TC 351 (CONSTRUCTION)**

**Environmental and Health Assessments through the
study of :**

**A : Chemical and Ecotoxicological analysis of water
passing through synthetic turf (following EN 12920)**

B :

**✓ VOC and Aldehydes emissions generated by
materials used in synthetic turf (following a new
protocol for construction materials (TC 351))**

✓ Health risks regarding several scenarios

ASSESSMENT OF THE GAS EMISSIONS

Characterization of the VOCs emissions and aldehyde



Preparation of the samples



Samples in the chambers of tests

Emission test chambers

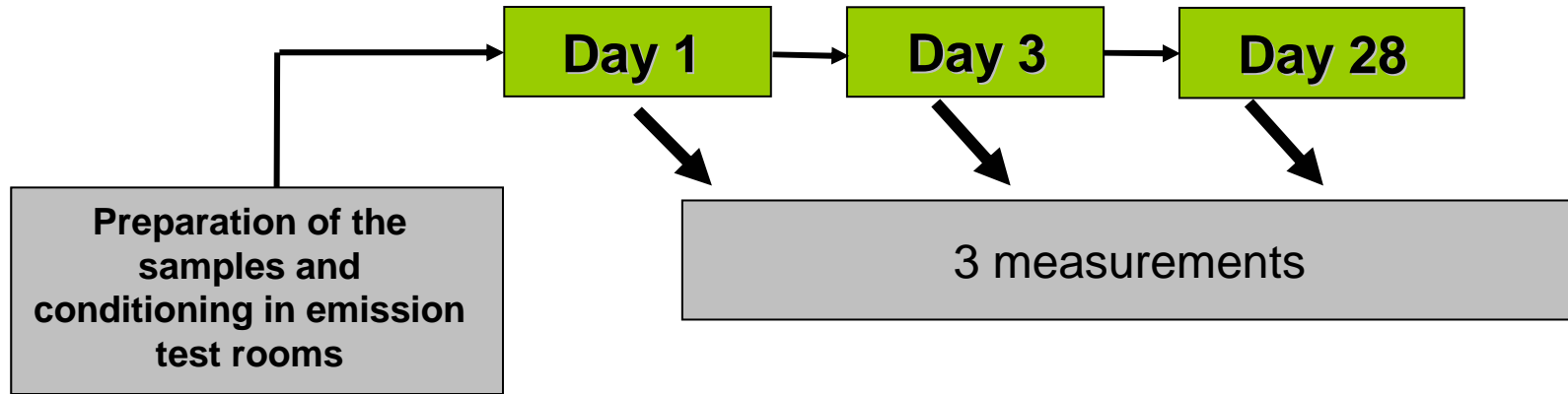
- VOCs measure:
NF ISO 16000-6
- Formaldehydes measure:
NF ISO 16000-3



Chambers of tests



ASSESSMENT OF THE GAS EMISSIONS



Recycled Rubber granules from tires



TPE granules

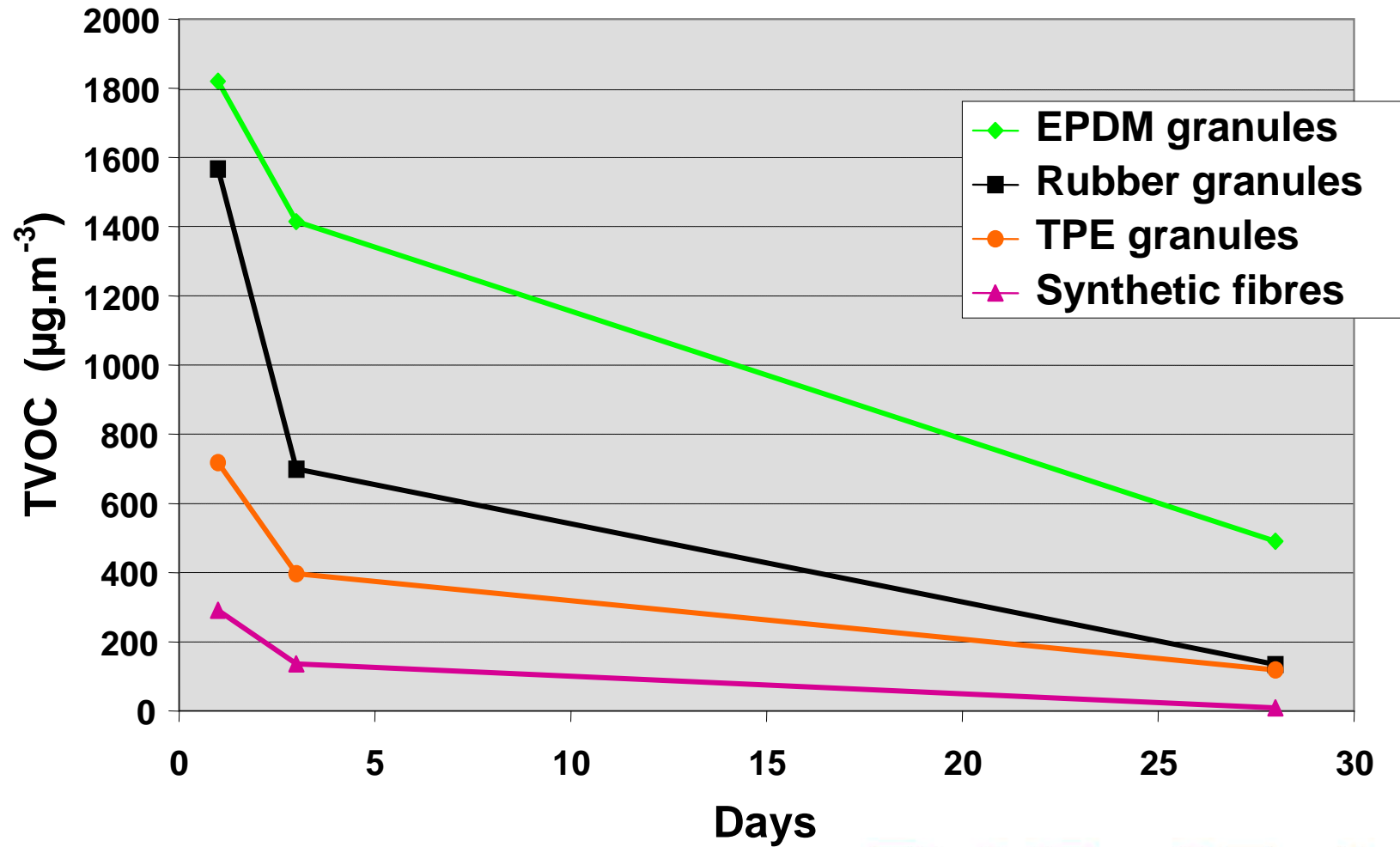


EPDM granules



Synthetic fibres

ASSESSMENT OF GAS EMISSIONS RESULTS

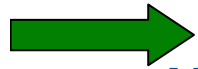


ASSESSMENT OF THE GAS EMISSIONS FIRST COMMENTS

 Very low emissions for synthetic fibres (reference sample)

 Rubber granules, TPE granules and EPDM granules :

 Low emissions comparable to known building materials



**NEXT STEP : ASSESSMENT OF THE HEALTH RISKS BASED ON
INDOOR EXPERIMENTAL MEASUREMENTS (Day 1, Day 3, Day 28)**

- Extremely complex measurements for outdoor fields (variable parameters)
- The Mathematical models estimate people's exposure when they are distanced by 100m of the emissive surface

EVALUATION OF THE HEALTH RISKS BASED ON INDOOR GAS EMANATIONS MEASUREMENTS

Evaluation carried out by INERIS (National Institute of Health Risk Evaluation)

WORST CASE SCENARIO

- Small Indoor field with a very low air renewal atmospheric ratio
- 2 types of exposition (acute and chronic)
- 4 different scenarios analysed by type of exposure :
 - Installers
 - Professional players
 - Non Professional Players
 - Spectators

ASSESSMENT OF THE HEALTH RISKS BASED ON INDOOR GAS EMANATIONS MEASUREMENTS

	Acute exposition	Chronic exposition
INSTALLERS	Gas emanations of Day 1	8h per day//70 days per year Gas emanations of Day 1
PRO PLAYERS	Gas emanations of Day 3	8h per day//365 days per year Gas emanations of Day 28
NON PRO PLAYERS	Gas emanations of Day 3	10h per week//44 weeks per year Gas emanations of Day 28
SPECTATORS	Gas emanations of Day 3	Present at every match Gas emanations of Day 28

ASSESSMENT OF THE HEALTH RISKS BASED ON INDOOR GAS EMISSIONS MEASUREMENTS CONCLUSIONS AND RECOMMENDATIONS

- For several VOC and aldehydes, modelised concentrations with measured gas emissions are comparable to typical atmospheric air concentrations
- No health risk caused by identified components and their concentrations in our worst case scenario whatever the infill
- No health risk caused by the use of infilled synthetic turf in an Indoor environment for players
- Thus no health risk caused by the use of infilled turf in an outdoor environment
- *Recommendation : For the safety of installers, it is necessary to have a renewal atmospheric ratio of > 2 vol/h in very small rooms*

GENERAL CONCLUSION

- **This complementary approach gives scientific information on the environmental impact of the different infilled synthetic turf systems found on the market.**
- **This study aims at being an outstanding reference on the market**
- **Our system based on recycled tire rubber granules has no impact whatsoever on the environment and no health risk for the users**
- **Whatever the infill (SBR, EPDM or TPE) the results are very similar (leaching, gas emission and health risks)**

Availability of Study results for Communication/ Sales Support

1st of February 2007

FieldTurf Tarkett™

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