Instituut voor Sportaccommodaties

Environmental and Health Study SBR Rubber Granulates

The Netherlands

Nicole Salzmann

ISA Sport

ISA Sport - general

- Instituut voor Sportaccommodaties (started in 1959)
- 3 departments: research, field testing, consultancy

Laboratory:

- sports floors
- materials for sports floors
- attributes
- development

On-site:

- quality monitoring
- certification


Certificaat

Betreft : Kunstgras voetbalveld
type: sliding proof

Locatie : Sportpark De Eendracht
F.C. De Goatjes
Noordenhoek

Gerealiseerd door : Ingenieursbureau Sporters World

INHOUD

- het voetbalveld is onder keur van ISA Sport aangelegd
- het voetbalveld voldoet aan de normen van NOC*NSF, code ISA-KNVB2-15.2, maart 2002
- het voetbalveld voldoet aan het reglement van de KNVB
- geldigheidsduur certificaat: 2003 t/m 2005

maart 2003

Instituut voor Sportaccommodaties B.V.

ing. T.A. Joosten
Directeur

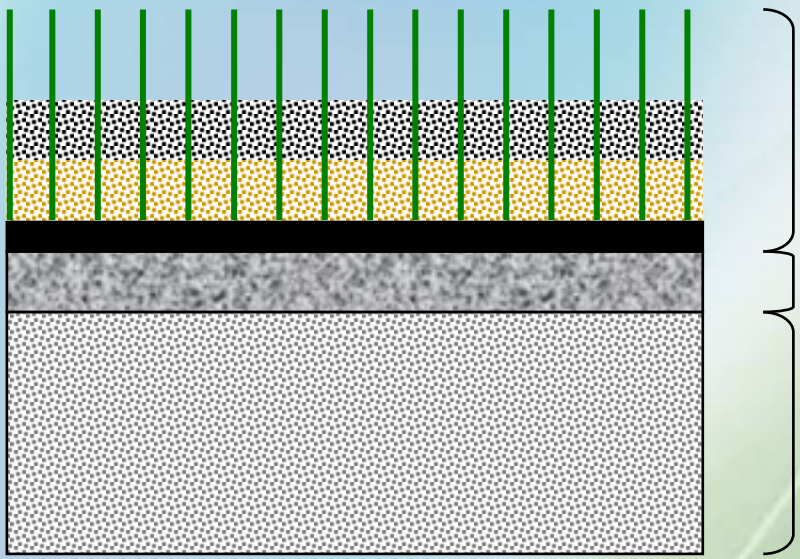
Sports facilities

ISA Sport - Accreditations

- FIFA
- UEFA
- IAAF
- FIH
- ITF
- Quality:
  ISO 9001 : 2000
  ISO 17025 : 2000

Artificial Turf for Football

Schematic view relevant layers:



sand / rubber filled turf

option: shock absorbing layer

base layer, e.g.:

- crushed stone
- asphalt
- lava stone
- lava / rubber crumb mixture

Artificial Turf - aims

Standards

- *Single countries*: dependent on local football associations

end 2006 (?): one CEN standard

- *International*:

UEFA and FIFA adopt one common standard

"FIFA Quality Concept"

March 2005

- *General (except Italy, Germany):*

no environmental or health requirements;

“local regulations”

Rumours…

“Giftige gassen boven kunstgrasvelden”

“mogelijk toch kankerverwekkend”

“Voetballen op kunstgras gevaarlijk”

Research needed

Steering committee

- contractors
- rubber recycling industry
- rubber producing industry
- Royal Dutch Football Association (KNVB)
- Dutch Olympic Committee * Sports Federation (NOC*NSF)
- Dutch ministries (VROM, VWS)

⇒ *independent research*

Research scope (1)

Research concentrated on:

- environmental risks
- health risks

- recycled tyre rubber granulates

  no virgin materials

- infill material in artificial turf football constructions

  no other applications (e.g. playgrounds)

- health risks for football player

  not for e.g. infill installers

Research scope (2)

Ultimate research goal:

- environmental
- health

} standard or directive for all infill materials

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Directeur

Certificaatnummer: T03.0099
Projectnummer : 28020000

Instituut voor Sportaccommodaties

Research execution

Independent experts on environment and toxicology:

- Intron (Project Manager)
- Industox (University of Nijmegen)
- National Institute for Public Health and Environment (RIVM)
- Kempeneers Environment and Management
- TNO
- DSM
- ISA Sport

Research content (1)

Research performed in 2 stages

<u>Stage 1:</u>

- literature study
- search for directives for judgement of results
- research on chemical composition of SBR rubber *)
- research on leaching behaviour of SBR rubber *)
- estimation health risks
- estimation environmental risks

*) *SBR rubber = recycled tyre rubber granulates*

Research content (2)

Stage 2:

- literature study continued
- research on leaching behaviour of SBR rubbers extended:
  - ageing due to use;
  - ageing in climatic chamber.
- research on health risks:
  - urine research on PAH exposure;
  - dermal exposure – PAH migration;
  - dermal exposure – local skin effects (literature).

Current status

Stage 1:

- Completed (June 2006)
- Report available via www.intron.nl

Stage 2:

- Running
- Report expected end of November

Results stage 1 (1)

Literature study:

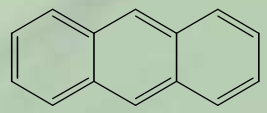
- Overview performed studies on tyres and granulates

  for summary: see report

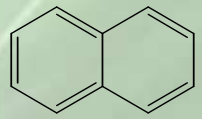
- Chemical composition, leaching effects, air and waste water

  measurements, dermal exposure PAH*)

- No 100% “no risks” conclusion



*) *PAH = Polycyclic Aromatic Hydrocarbon*



Results stage 1 (2)

Search for directives:

- Tyres: European directive for reduction of PAH (from 2010)
- Toys: European guideline for heavy metals concentrations
- DIN V 18035-7: aims leaching of heavy metals, DOC, EOX *)

  "mild" test: with 2nd 24-hours eluate
- Dutch *Bouwstoffenbesluit (BSB)* for environment
- Infill rubber: no international guidelines

*) *DOC = Dissolved Organic Carbon*

EOX = Extracted Organic Halogens

Results stage 1 (3)

Search for directives:

- *BSB* = Resolution for Building Materials:
  - for stone-like materials (e.g. asphalt, lava, clay courts)
  - limit values for PAH and leaching of metals
  - minimum application height 20 cm
  - leaching tests: colomn experiments (NEN 7383/7344)

  ⇒ water, pH=7, 20ºC, 21 days

Results stage 1 (4)

<u>Research on chemical composition/leaching behaviour:</u>

Investigated samples:

- Production: samples taken at 3 granulate producers
- Field: samples taken at 5 football fields < 1 year old

Results stage 1 (5)

Research on chemical composition:

All compounds studied below maximum level of BSB

Results stage 1 (6)

Research on leaching behaviour:

- Leaching of PAH very low
- Zinc (Zn) concentration

Sample	Production [mg/kg]	Field [mg/kg]
1	4.6	*12*
2	4.0	*41*
3	*12* [1)]	*19*
4	-	*53*
5	-	*33*
mean	6.9	*32*
BSB	≤ 8.4 mg/kg [2)]	

[1)]: truck tyre granulates

[2)]: E_{max} = 130 mg/kg

Results stage 1 (7)

Evaluation environmental risks:

- Leaching of Zn: research to be extended
  - Field samples with truck tyre granulates
  - Effect of ageing:
    - × fields 3 years old;
    - × samples aged in climatic chamber.

Results stage 1 (8)

Evaluation health risks:

- SBR rubber contains hazardous components, but:
  - Heavy metal concentration meets toys standard
  - Available for football player?
  - Research to be extended:
    - × allergic and irritation effects?
    - × PAH-uptake via skin?
      - ⇒ migration research
      - ⇒ urine research

Urine research

- PAH uptake ⟹ 1-hydroxypyrene in urine (marker)
- Football players (non-smoking) on SBR rubber field
  - urine samples during 3 days
  - 2 hours of playing on day 2
  - effect of massage oil

Nitrosamines $R_2N\text{-}N=O$

<u>Air measurements 1 field during use:</u>

- Dust particles with PAH and heavy metals
- Volatile aromatic hydrocarbons (“AH”)
- Volatile nitrosamines



⇨ *Uptake hazardous compounds via respiration?*

Nitrosamines - conclusion

Results air measurements 1 field during use:

- Amount PAH + heavy metals increases during use;

  levels lower than health threshold
- No volatile aromatic hydrocarbons found
- Level of nitrosamine (NDEA) *higher* than health threshold

3 times a week – 2 hr football training:

Maximum Exceptable Risk level exceeded after 8 years

⇨ *Extended measurements on NDEA*

Brief summary

Extended and thorough research on

environmental and health risks of SBR rubber

in The Netherlands

Reports expected end of November

Instituut voor Sportaccommodaties

Thank you!