

# Radiological study of transport and processing of naturally occurring radioactive materials.

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## Outline

- NuTeC
- NORM projects
  - NuTeC-NORM
  - B-NORM
  - EUR-NORM
- New research topic:
  - treatment of (NORM) contaminated waste



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- U Hasselt (CMK/TANC, Diepenbeek, Belgium)
- XIOS University College (Diepenbeek, Belgium)
  - Industrial Sciences: **“Nuclear and environmental Engineering”**
    - Environmental Technology-Radiochemistry
    - Medical Nuclear Technology



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NORM-Projects



- Environmental and Energy related research
- Development and application of nuclear measurement aperture



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NORM-Projects

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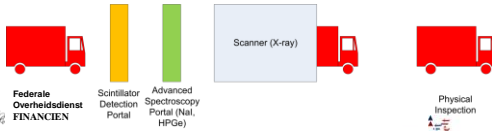
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NuTeC –NORM project (15/12/08 – 14/12/10)

NORM-Projects

1. Construction of a NORM-database (Harbor of Antwerp)



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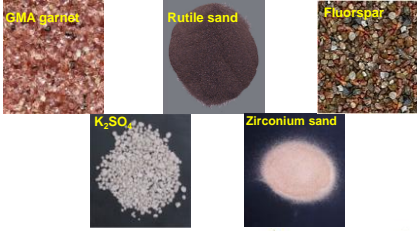


NuTeC –NORM project

NORM-Projects

3. Case Studies at several NORM Companies

- Supplying information and training for companies in working with NORM
- Making an inventory of the presence and activity of NORM and propose measures for radiation protection.




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NORM industries (New European Directives BSS)

NORM-Projects

- List of NORM industries which will require regulatory consideration:
  - Extraction of rare earth from monazite
  - Production of thorium compounds and thorium containing products
  - Processing of niobium/tantalum ore
  - Oil and gas production
  - Geothermal energy production
  - TiO<sub>2</sub> pigment production
  - Thermal phosphorus production
  - Zircon and zirconia industry
  - Production of phosphate fertilisers
  - Cement production, maintenance of clinker ovens
  - Coal-fired power plants, maintenance of boilers
  - Phosphoric acid production
  - Primary iron production
  - Tin/Lead/Copper smelting
  - Ground water filtration facilities
  - Mining of ores other than Uranium ore
- Including relevant secondary processes
- Member States should add other relevant activities




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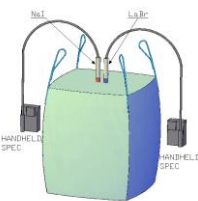
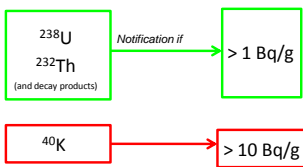
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A new method for characterisation of NORM

NORM-Projects

**\*European list NORM-industries for strict regulation:**

NORM-nuclides:




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## EUR-NORM: 4th EAN-NORM workshop

### ROUND TABLE WORKSHOP



“Transportation of NORM,  
NORM Measurements and Strategies,  
Building Materials”

Second Announcement  
Nov. 29<sup>th</sup> - Dec. 1<sup>st</sup> 2011,  
Hasselt (Belgium)

- Duo presentations
- Exhibition
- <http://www.ean-norm.net/>



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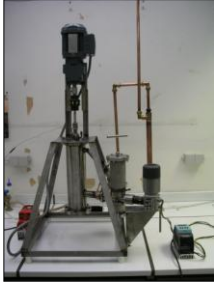
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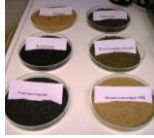
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## Pyrolysis

NORM-Projects



- **Input: Biomass / waste:**
  - Rapeseed cake
  - Metal contaminated willow
  - Domestic waste
  - Sludge from water treatment
  - ...



- NORM contaminated biomass or waste?



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## Pyrolysis

NORM-Projects



- **Output → validation**
  - Pyrolysis liquid
  - Pyrolysis gas
  - Char
    - **Valorisation activated carbon:**  
Adsorbens for metals, radionuclides?



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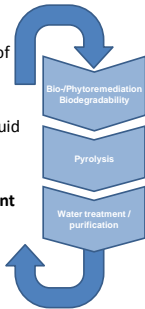
## New research topics:

### Treatment contaminated soils and waste water

NORM-Projects

- **Bio- and/or phytoremediation** for the treatment of the radiological contaminated soils.
- Conversion of (Contaminated) biomass to char, liquid and gasses by means of **pyrolysis**.
- Study of (activated) char carbon is for the **treatment of the waste water** at contaminated sites.

Collaboration: XIOS – UHasselt – KULeuven - KHLim - SCK-CEN



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## Acknowledgement

NORM-Projects

- NORM projects Sponsored by:
  - Flemish Community (**Hermesfonds**, 45%),
  - European Funds for Regional Development (**EFRO-support**, 40%)
  - XIOS University College Limburg (15%).
- New research 'treatment contaminated soils and waste water sponsored by:
  - LRM




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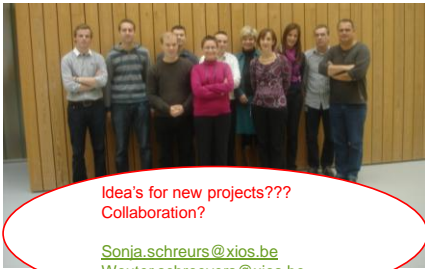
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## NuTeC – [www.nutec.be](http://www.nutec.be)

NORM-Projects

PHONE: 0032(0)11370795  
 GSM: 0032(0)472361469



Idea's for new projects???  
 Collaboration?  
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[Wouter.schroeyers@xios.be](mailto:Wouter.schroeyers@xios.be)




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