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Novel ceramic thin Film based Scintillator for high resolution X-Ray imaging

Action Line: NMP Nanotechnologies and nanosciences, knowledge based multifunctional materials and new production processes and devices

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X-ray imaging devices are powerful tools, which provide information about the inner structure of samples during non-destructive examination. However, a range of applications such as studies of early formation stages of metallic foams or conveyor-belt inspection suffer from poor spatial resolution and limited Detective Quantum Efficiency (DQE) of scintillator materials which are used in the detectors available at the moment. The basis of our proposal is the development of new thin layer scintillators for high resolution imaging using X-radiation.

The proposed project contains the development and optimisation of production processes of substrate and thin layer using Liquid Phase Epitaxy, transfer of these processes to an industrial partner, characterisation of the novel scintillators and tests for different applications with X-radiation from synchrotrons and X-ray tubes. The project will focus on Lu₂SiO₅:Eu (LSO:Eu) to improve the Detective Quantum Efficiency of the detector.

The high absorption efficiency of this ceramic material promises an obvious improvement in the light yield, while the possibility of microstructuring can lead to an improvement in the spatial resolution, especially at high energies. Additionally by applying an anti-reflex coating the wave-guiding effect can be suppressed leading to a higher image quality. Combining these new scintillators with suitable electronics will result in an optimised type of compact X-ray detector. Due to the higher DQE the new scintillator will allow X-ray tomography of medical and biological samples with lower radiation exposure.

The usage of such systems in automated inspection systems will improve the product safety. The advanced spatial resolution even at higher energies and reduced exposure times are interesting aspects for tomography measurements with synchrotron radiation resulting in an enhanced field of applications and a significantly increased number of measured samples in a time unit.

Project details

Project Reference: 33427

Contract Type: Specific Targeted Research Project

Start Date: 2006-10-01

End Date: 2009-09-30

Duration: 36 months

Project Status: Execution

Project Cost: 2.3 million euro

Project Funding: 1.45 million euro

Participant Organization: INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

Country: FRANCE

Participant Organization: COMMISSARIAT À L'ENERGIE ATOMIQUE

Country: FRANCE

Participant Organization: BUNDESANSTALT FÜR MATERIALFORSCHUNG UND -PRÜFUNG **Country:** GERMANY

Participant Organization: FORSCHUNGSINSTITUT FÜR MINERALISCHE UND METALLISCHE WERKSTOFFE -EDELSTEINE/EDELMETALLE- GMBH **Country:** GERMANY

Participant Organization: PHOTONIC SCIENCE LIMITED **Country:** UNITED KINGDOM

Participant Organization: OPTIQUE HENRI PETER SAS **Country:** FRANCE

Participant Organization: INNOSPEXION APS **Country:** DENMARK

RCN: 81377

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