Technology Offer

Use of silica nanoparticles for transforming municipal solid waste incineration (MSWI) fly ash into composite filler

Summary

A Singapore educational and research institution has developed a practical, scalable, low energy-consumption and economically viable solution to process the municipal solid waste incineration (MSWI) fly ash and integrated with the incineration site to minimise production costs. The institution is seeking license agreement or research cooperation agreement with industrial SMEs of all sizes or MNEs.

Creation Date	09 June 2017
Last Update	19 June 2017
Expiration Date	19 June 2018
Reference	TOSG20170609001

Details

Description

In order to convert MSWI fly ash into useful materials, the toxic heavy metals in the ash have to be removed or stabilised. The current technologies such as electrochemical, sintering and vitrification have many limitations, i.e. high cost, high-energy consumption and the generation of more waste.

The technology developed by the institution features a practical, scalable, low energy-consumption and economically viable solution to process the MSWI fly ash in a way that binds and immobilises toxic heavy metals that are present in the ash. The process is based on the use of novel silica nanoparticles which have high surface areas and medium-sized pores. The process can be scaled up and integrated with the incineration site.

The process utilises a continuous stirred-tank reactor (CSTR) that is able to treat about 10 kg/day of municipal solid waste incineration (MSWI) fly ash. The CSTR setup is scalable, has a small footprint and is integrated with water recycling process in the reactor to allow water reclamation for subsequent stabilisation reactions. In general, the CSTR system consists of four major systems:

(i) feed preparation;
(ii) a reactor made of borosilicate glass with temperature and pH control systems;
(iii) a salt recovery system which consists of evaporator-crystalliser, condenser and water recycling system, and;
(iv) two vacuum filtration systems for collection of stabilised incineration fly ash and salts, respectively.

The process utilises specialised silica nanoparticles and is expected to increase the entrapment efficiency of heavy metals by 20-30% as compared to competing processes which reduces the amount of silica needed. The treated fly ash is expected to comply with European Standards, EN12457-2 and NEN7375. The commercial viability of the system has been demonstrated by incorporating the treated fly ash into polymer-matrix composite products.

The institution seeks R&D and licensing partnerships with industry players (SMEs of all sizes or MNEs) with an interest to use this technology for product development.

Advantages and Innovations

This technology is able to integrate with waste-to-energy plants to utilise the MSWI fly ash generated directly for reuse. Companies producing composite materials would also be able to utilise this renewable material for their production for high-quality composites. These composites have a wide application in aerospace, automobile, marine, wind power, infrastructure and sports equipment. Thus, this technology will not only reduce disposal cost but instead generate revenue from waste.

Benefits:
- Offers a cost-effective process to produce higher value-added products from waste, which has a wide variety of applications
- Reduces the disposal cost
- Creates revenue from waste
- Utilises high surface area and tailor designed medium-sized of colloidal silica nanoparticles for better efficiency
- The chemical stabilisation process of solid waste is highly scalable

Stage of Development

Under development/lab tested

IPR Status

Patent(s) applied for but not yet granted

Profile Origin

Other

Keywords

Technology

02002002	Coatings
02007005	Composite materials
02007024	Nanomaterials

Market

08001023	Other chemicals and materials (not elsewhere classified)

NACE

C.32.9.9	Other manufacturing n.e.c.
E.38.2.1	Treatment and disposal of non-hazardous waste
E.39.0.0	Remediation activities and other waste management services

Open for EOI : Yes

Dissemination

Send to Sector Group

Materials

Client

Type and Size of Organisation Behind the Profile

University

Year Established

0

Already Engaged in Trans-National Cooperation

Yes

Languages Spoken

English

Client Country

Singapore

Partner Sought

Type and Role of Partner Sought

The institution seeks to work with SMEs of all sizes or MNEs in a licensing or research cooperation agreement partnership.

The partner sought could be an industry player from the sectors such as, but not limited to manufacturing, materials, wastes management who is keen to explore the following types of partnerships:

i) Licensing agreement:
The partner can license the technology to further develop and commercialise it to offer to their customers.

ii) Research cooperation agreement:
The partner undertake joint R&D with the Singapore company to develop the technology further into new products that can cater to specific market needs or customer segments.

Type and Size of Partner Sought

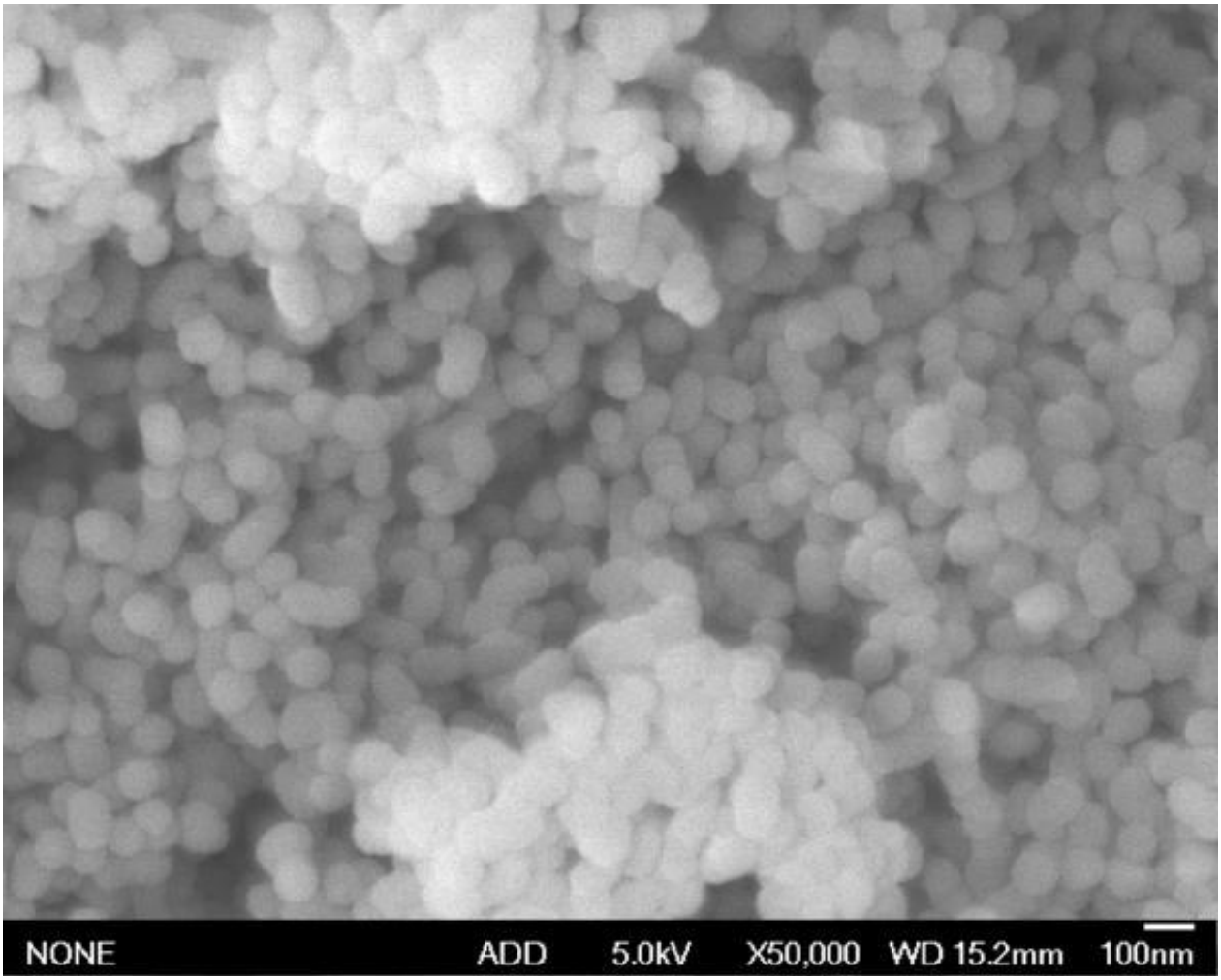
SME 11-50,SME <10,>500 MNE,251-500,SME 51-250,>500

Type of Partnership Considered

License agreement
Research cooperation agreement

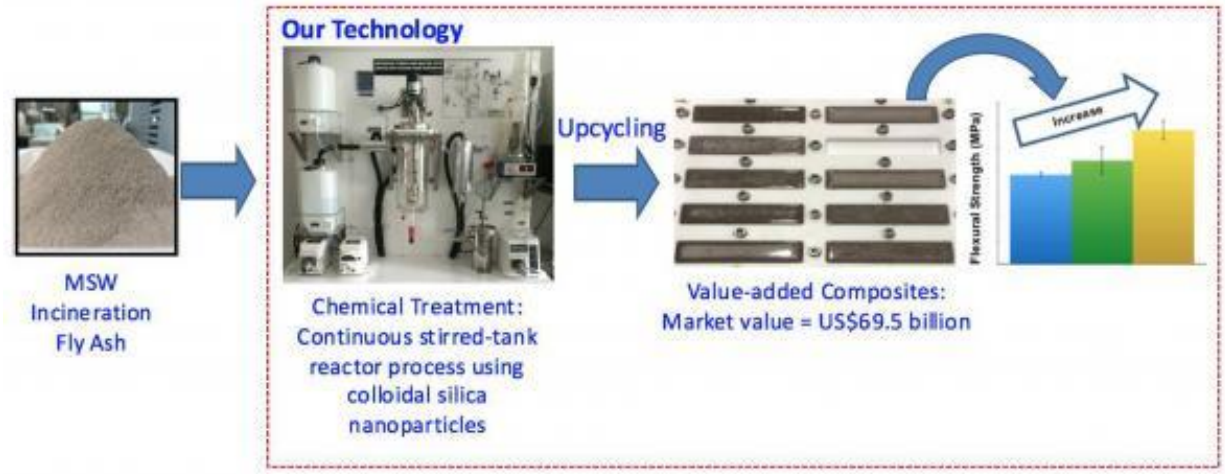
Attachments

MSWI2.jpg



MSWI1.jpg

Partnering Opportunity



Technology Offer

A French manufacturer of radiation measurement tools via smart detectors is looking for technical cooperation

Summary

A French company has developed integrated measurement solutions for detection, localisation and radionuclides identification in natural and industrial environments. The company would like to present its technology offer of radioactivity sensors outside France and to improve its products through a commercial agreement with technical assistance, technical or research cooperation with research centers or industrial companies.

Creation Date	10 June 2016
Last Update	06 June 2017
Expiration Date	17 December 2017
Reference	TOFR20160530001

Details

Description

The nuclear and radiological instruments designed and manufactured by the French company include spectrometers based on specific crystals and X or gamma-ray probes. They have been produced in the framework of a partnership with the French Alternative Energies and Atomic Energy Commission (CEA).
The issues concern in particular the question of radioprotection (medical staff, researchers or first responders) but also homeland security, nuclear waste management, dismantling of nuclear power plants and nuclear and radiological threats or incidents.

The company is looking for technical partners to participate to bilateral programs (such as EUROSTARS, ..) or framework programs such as H2020 secure societies.

Advantages and Innovations

The company offers a range of solutions which include miniature embedded detectors, electronic interfaces and communication protocols which allow using the sensors with smartphones, laptops or tablets. These also guarantee the functional durability of the solution specifically designed for the customers' needs and perfectly adaptable to systems already in place.

Technical specifications for the probe:
- light (<100g)
- dose rate in motion and in real time and fast measurement
- resistant to temperature, vibrations, shocks and irradiation
- user-friendly for non-expert professional
- wide measurement range: 0.1 µSv/h – 100 mSv/h or 100 µSv/h – 10 Sv/h

Technical specifications for the spectrometer:

- light (< 50 g)
- isotopic identification in motion and fast measurement
- user-friendly
- wide measurement range: 20 keV – 3 MeV
- high energy resolution < 3.5 % (137Cs)

Stage of Development

Already on the market

Comments Regarding Stage of Development

The devices are qualified according to standards in force EN 60 846 (CEI, CE, CEM, ISO)

IPR Status

Exclusive Rights

Comment Regarding IPR status

The company benefited in 2011 from exclusive concessions of two patented operating licenses from the Alternative Energies and Atomic Energy Commission (or CEA in French)

Profile Origin

National or Regional R&D programme

Keywords

Technology

09003	Electronic measurement systems
10001005	Radiation Protection
10002008	Measurement and Detection of Pollution
10003005	Radioactive Waste

Market

03004003	Other electronics related equipment
06001004	Equipment and instrumentation
08004004	Other pollution and recycling related

NACE

C.26.5.1	Manufacture of instruments and appliances for measuring, testing and navigation

Open for EOI : Yes

Dissemination

Send to Sector Group

Intelligent Energy

Client

Type and Size of Organisation Behind the Profile

Industry SME <= 10

Year Established

2011

Turnover

<1M

Already Engaged in Trans-National Cooperation

No.

Languages Spoken

English
French

Client Country

France

Partner Sought

Type and Role of Partner Sought

The company has been part of several research programs for many years and would like to work with research centers and European industrial manufacturers in order to improve its products and its areas of expertise. Research cooperation agreements or technical cooperation agreements could be signed with the partner.

Type and Size of Partner Sought

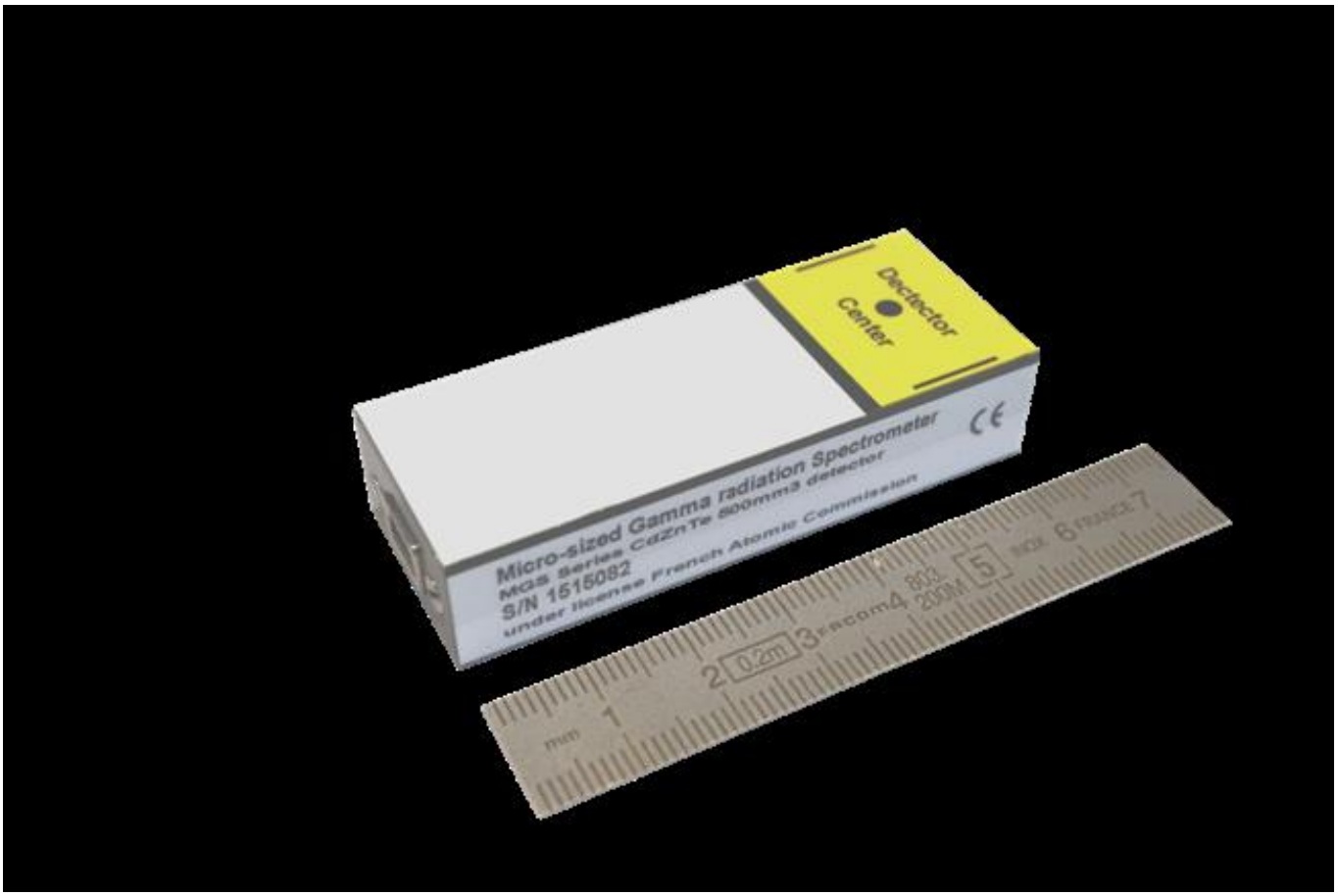
SME 11-50,University,R&D Institution,SME <10,>500 MNE,251-500,SME 51-250,>500

Type of Partnership Considered

Commercial agreement with technical assistance
Technical cooperation agreement
Research cooperation agreement

Attachments

detection and identification of nuclear material image 1.png


Micro-sized Gamma radiation Spectrometer
MGS series CdZnTe 500mm3 detector
S/N 1515082
under license French Atomic Commission
Dectector
Center
CE