Radiation Hazard Location

Radiation Detector
JS Stanley
US Patent 8,399.859 B2 March 19, 2013
Using semi spherical PRESAGE with a lead collimator to detect contaminated Hot Cells

Improving the Presage Polymer Radiosensitivity for Hot Cell and Glovebox 3D Characterization
Adamovics, John; Farfan, Eduardo B.; Coleman, J. Rusty
Health Physics (2013), 104(1), 63-67.
RadBall is a novel, passive, radiation detection device that provides 3D mapping of radiation from areas where measurements have not been possible previously due to lack of access or extremely high radiation doses. This kind of technol. is beneficial when decommissioning and decontamination of nuclear facilities occur. The key components of the RadBall technol. include a tungsten outer shell that houses a radiosensitive PRESAGE polymer. The 1.0-cm-thick tungsten shell has a no. of holes that allow photons to reach the polymer, thus generating radiation tracks that are analyzed.

Submerged RadBall Deployments in Hanford Site Hot Cells Containing 137CsCl Capsules
Farfan, Eduardo B.; Coleman, J. Rusty; Stanley, Steven; Adamovics, John; Oldham, Mark; Thomas, Andrew
Health Physics 103:100-106 (2012)
The overall objective of this study was to demonstrate that a new technol., known as RadBall, could locate submerged radiol. hazards. RadBall is a novel, passive, radiation detection device that provides a 3-D visualization of radiation from areas where measurements have not been previously possible due to lack of access or extremely high radiation doses. This technol. has been under development during recent years, and all of its previous tests have included dry deployments. This study involved, for the first time, underwater RadBall deployments in hot cells contg. CsCl capsules at the U.S. Department of Energy's Hanford Site. RadBall can be used to characterize a contaminated room, hot cell, or glovebox by providing the locations of the radiation sources and hazards, identifying the radionuclides present within the cell, and detg. the radiation sources' strength (e.g., intensities or dose rates). These parameters have been previously detd. for dry deployments; however, only the location of radiation sources and hazards can be detd. for an underwater RadBall deployment. The results from this study include 3-D images representing the location of the radiation sources within the Hanford Site cells. Due to RadBall's unique deployability and non-elec. nature, this technol. shows significant promise for future characterization of radiation hazards prior to and during the decommissioning of contaminated nuclear facilities.

Locating Radiation Hazards and Sources within Contaminated Areas by Implementing a Reverse Ray Tracing - Technique in the Radball Technology.

E Farfan, S Stanley, C Holmes, K Lennox, M Oldham, C Clift, A Thomas, and J Adamovics

Health Phys 102(2):196-207 (2012)

RadBall® is a novel technol. that can locate unknown radioactive hazards within contaminated areas, hot cells, and gloveboxes. The device consists of a colander-like outer tungsten collimator that houses a radiation-sensitive polymer semisphere. The collimator has a no. of small holes; as a result, specific areas of the polymer are exposed to radiation, becoming increasingly more opaque in proportion to the absorbed dose. The polymer semisphere is imaged in an optical computed tomog. scanner that produces a high resoln. three-dimensional map of optical attenuation coeffs.

Locating Radiation Hazards and Sources within Contaminated Areas by Implementing a Reverse Ray Tracing Technique in the RadBall Technology

Eduardo B. Farfán, Steven Stanley, Christopher Holmes, Kathryn Lennox, Mark Oldham, Corey Clift and John Adamovics

Health Physics Journal March 3, 2011

RadBall is a novel technology that can locate and quantify unknown radioactive hazards within contaminated areas, hot cells, and glove boxes. The device consists of a colander-like outer tungsten collimator that houses a radiation-sensitive polymer semi-sphere. The collimator has a number of small holes; as a result, specific areas of the polymer are exposed to radiation becoming increasingly more opaque in proportion to the absorbed dose. The polymer semisphere is imaged in an optical computed tomography scanner that produces a high resolution 3D map of optical attenuation coefficients. A subsequent analysis of the optical attenuation data using a reverse ray tracing technique provides information on the spatial distribution of gamma ray sources in a given area forming a 3D characterization of the area of interest. The RadBall technology and its reverse ray tracing technique were investigated using known radiation sources at the Savannah River Site's Health Physics Instrument Calibration Laboratory and unknown sources at the Savannah River National Laboratory's Shielded Cells.

Locating, quantifying and characterising radiation hazards in contaminated nuclear facilities using a novel passive non-electrical polymer based radiation imaging device

Stanley, S. J.; Lennox, K.; Farfan, E. B.; Coleman, J. R.; Adamovics, J.; Thomas, A.; Oldham, M.

Journal of Radiological Protection (2012), 32(2), 131-145.

This paper provides a summary of recent trials which took place at the US Department of Energy Oak Ridge National Lab. (ORNL) during Dec. 2010. The overall objective for the trials was to demonstrate that a newly developed technol. could be used to locate, quantify and characterize the radiol. hazards within two sep. ORNL hot cells (B and C). The technol. used, known as RadBall, is a novel, passive, non-elec. polymer based radiation detection device which provides a 3D visualisation of radiation from areas where effective measurements have not been previously possible due to lack of access

RadBall technology testing and MCNP modeling of the tungsten collimator
Farfan, Eduardo B.; Foley, Trevor Q.; Coleman, J. Rusty; Jannik, G. Timothy; Holmes, Christopher J.;Oldham, Mark; Adamovics, John; Stanley, Steven J.
Journal of Physics: Conference Series (2010), 250
The United Kingdom's National Nuclear Lab. (NNL) has developed a remote, non-elec., radiation-mapping device known as RadBall, which can locate and quantify radioactive hazards within contaminated areas of the nuclear industry. RadBall consists of a colander-like outer shell that houses a radiation-sensitive polymer sphere. The outer shell works to collimate radiation sources and those areas of the polymer sphere that are exposed react, becoming increasingly more opaque, in proportion to the absorbed dose. The polymer sphere is imaged in an optical-CT scanner.

RadBall Technology Testing in the Savannah River Site's Health Physics Instrument Calibration Laboratory
Farfan, E., B.; Foley, Trevor Q.; Jannik, G. Timothy; Harpring, Larry J.; Gordon, John R.; Blessing, Ronald; Coleman, J. Rusty; Holmes, Christopher J.; Oldham, Mark; Adamovics, John
Journal of Physics: Conference Series (2010), 250, No pp. given.
The United Kingdom's National Nuclear Lab. (NNL) has developed a radiation-mapping device that can ocate and quantify radioactive hazards within contaminated areas of the nuclear industry. The device, known as RadBall, consists of a colander-like outer collimator that houses a radiation-sensitive polymer sphere. The collimator has over two hundred small holes; thus, specific areas of the polymer sphere are exposed to radiation becoming increasingly more opaque in proportion to the absorbed dose. The polymer sphere is imaged in an optical-CT scanner that produces a high resoln. 3D map.

RADBALL: a new departure for 3-D Dosimetry
Doran, Simon J.; Stanley, Steven J.; Jenneson, Paul M.; Prott, Erwan; Adamovics, John
Journal of Physics: Conference Series (2009),164
This paper describes a new device, RADBALL for mapping environmental radiation fields, as found in the area of nuclear decontamination. The system consists of a specially shaped PRESAGE dosimeter, which sits inside a custom-designed lead collimator. This is imaged using optical CT to yield data from which the position of either point sources or extended objects may be reconstructed. The principle of the technique is explained, simulations and preliminary data are given and the current design of the dosimeter and collimator are presented.