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Optic Fibre Sensors for Temperature Sensing in Pressurized Water Reactors

Fibre Optic Sensors (FOS) are fibres with optionally a specific preparation or functional coating, which endows the sensitivity to various environmental parameters. The sensor is designed for extreme environments. Specifically, the environment of a nuclear reactor core, where the dose may be 2 GGy in two weeks of operation. The technologies are based on Fibre Bragg Gratings (FBGs), and also Long Period Gratings (LPGs). Using sense-region-gratings written into the fibre, one can measure length changes at the sensor with 1 pico-meter precision.

There is growing interest in optical fibre based sensors for application in nuclear reactors because of their intrinsic attributes, such as package compactness, high bandwidth, multiplexing, able to measure remotely in real time, and immunity to most electromagnetic perturbations. In-core, real-time, on-line and multi-parameter information gathering sensors throughout the nuclear power system could have the potential to improve efficiency and subsequently the overall cost of the nuclear power systems. In addition, the safety case would be greatly enhanced. FOS are presented as a remarkable new opportunity for sensing, especially in all kinds of extreme environments, and they represent a niche opportunity in the context of nuclear energy generally (PWR, BWR). In-core-sensor, on-line technology for sensing temperature, as well as other parameters can enable instantaneous Reactor State knowledge enabling novel reactor operations and management. We discuss the current state of our experimental and theoretical programme.

Apply to be considered for a student ; award (Yes / No)?

No

Level for award;(Hons, MSc, PhD, N/A)?

N/A

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