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Development of a novel fiber-optic sensor to measure radon in the deep ocean

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The radon concentration in the deep ocean has gained increasing interest in the last decades. The underwater monitoring of this natural radioactive gas can give important information about submarine groundwater discharges, groundwater migration and contamination. Radon concentration has also been studied as a possible indicator of earthquake events which can have devastating consequences when the epicenter is located at the sea.

In contrast with radon monitoring studies in caves, mines, and underground soil, there is an utter lack of information about radon in deep-sea. These measurements are particularly difficult to attain due to the challenges that marine-like environments post to electronic sensing devices and their maintenance over time.

Gamma rays emitted by radon's progeny can be easily detected when interacting with a scintillator material. Recently, optical fiber doped with scintillating material has emerged has an alternative for gamma ray detection. The lightweight, low transmission loss, immunity to electromagnetic interference and the cost effectiveness makes optical fiber a compelling solution for radiation detection when compared to conventional sensors. In this work a compact all-fiber optical sensor is developed for continuous gamma ray detection in the deep sea. This sensor is composed by a scintillating optical fiber coupled to a polymeric optical fiber that allows the detection of low levels of radiation.