

Overview of Electron Paramagnetic Resonance-Based Human Tooth Dosimetry

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A triage effort requires a dosimetric technique to quickly screen many people for radiation dose after a severe nuclear accident, such as Fukushima Daiichi nuclear power plant disaster in 2011. Electron paramagnetic resonance (EPR) is one of the magnetic resonance techniques and can detect free radicals. Since radiation to tooth enamel generates very stable free radicals, EPR spectroscopy can measure free radicals in a human subject's tooth enamel noninvasively. The radiation-induced signal (RSI) from exposed tooth enamel is proportional to the radiation dose (Fig. 1). Therefore, EPR spectroscopy can be applied to retrospective dosimetry on a human tooth for the triage purpose after the nuclear accident. While the general population does not wear radiation badges in their daily lives, EPR tooth dosimetry can assess the radiation dose for the people who may be exposed after the fact. An overview of EPR tooth dosimetry and a brief introduction of a 1.1-GHz EPR spectrometer for human tooth dosimetry will be presented in this talk.

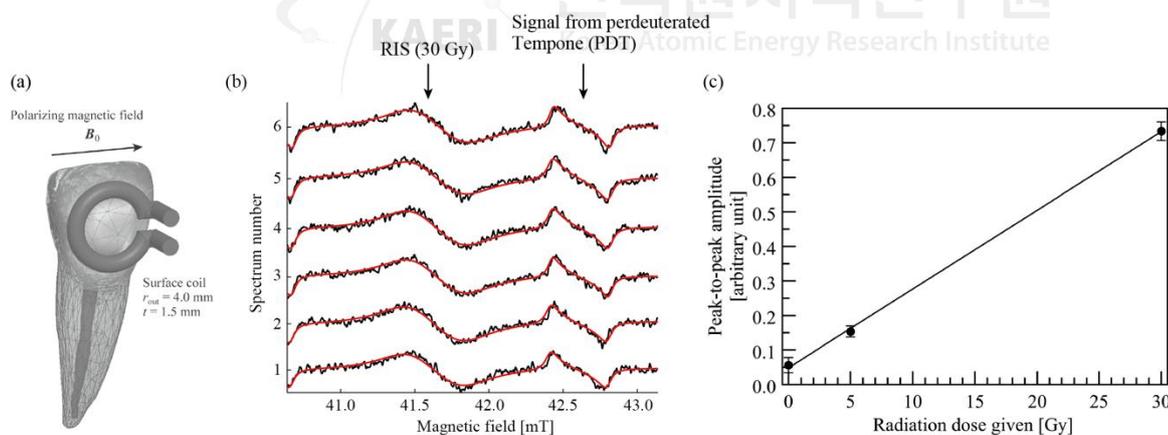


Fig. 1. (a) Numerical model of a human incisor and a 1.1-GHz EPR resonator's surface coil. (b) A radiation-induced signal from a 30-Gy irradiated tooth. (c) Radiation-induced signal response to known radiation doses. Adapted from H. Sugawara *et al.*, *IEEE Trans. Biomed. Eng.*, **61**, 1894–1901, 2014.

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