

## Development of an Optically Stimulated Luminescence dosimeter capable of real-time measuring for diagnostic X-ray system

Sota Goto<sup>1</sup>

Takuya Kasue<sup>1</sup>, Shinya Takarabe<sup>1</sup>, Keiji Takahisa<sup>1</sup>, Takashi Asahara<sup>2</sup>, Natsumi Kimoto<sup>3</sup>, Kazuki Takegami<sup>4</sup> and Hiroaki Hayashi<sup>5</sup>

<sup>1</sup> Faculty of Health Sciences, Kobe Tokiwa University, Japan

<sup>2</sup> Faculty of Health Sciences, Okayama University, Japan

<sup>3</sup> Faculty of Health Sciences, Junshin Gakuen University, Japan

<sup>4</sup> Department of Radiological Technology, Yamaguchi University hospital, Japan

<sup>5</sup> College of Transdisciplinary Sciences for Innovation, Kanazawa University, Japan

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S. Goto<sup>1</sup>, T. Kasue<sup>1</sup>, S. Takarabe<sup>1</sup>, K. Takahisa<sup>1</sup>, T. Asahara<sup>2</sup>, N Kimoto<sup>3</sup>, K. Takegami<sup>4</sup>, H. Hayashi<sup>5</sup>

<sup>1</sup> Faculty of Health Sciences, Kobe Tokiwa University, Japan

<sup>2</sup> Faculty of Health Sciences, Okayama University, Japan

<sup>3</sup> Faculty of Health Sciences, Junshin Gakuen University, Japan

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### Aims:

Medical exposure has been increasing, and it is important to manage the doses appropriately. If the actual dose measurement method is established, a lot of useful information for reducing the doses can be obtained. Although there were some trial cases of dose measurement using passive-type dosimeters [1,2], the development of measurement methods is a challenge. We would like to propose the dose measurement procedure using an active-type dosimeter which can use time data.

This study aims to develop a small active-type dosimeter and to demonstrate the feasibility of actual dose measurement.

### Materials & Methods:

Our dosimeter is made of the Optically Stimulated Luminescence (OSL) sheet and Multi Pixel Photon Counter. Although OSL dosimeters have been usually used as passive-type dosimeters, real-time signals can be obtained by measuring the prompt emission of the luminescence. The dose linearity and dose rate dependence were experimentally evaluated using general diagnostic X-ray equipment. The parameters were as follows: tube voltage of 80 kV, tube currents of 32–200 mA, and exposure times of 20–1000 ms. The reference doses were measured with an ionization chamber.

### Results:

Real-time signals were obtained at 10  $\mu$ s intervals. The result is displayed in Fig. 1. A good linearity between the measured counts and the dose obtained by reference dosimeter was observed for 0.2–10 mGy. Our dosimeter can be used without any correction of dose rate dependence for the dose rate of 4.8–12 mGy/s. It is expected our dosimeter can be applicable

to actual patient dosimetry because our dosimeter indicates good results for the range of diagnostic X-ray regions.

Reference:

[1] H. Hayashi, et al., Medical Physics, 48(8), 2021

[2] S. Goto, et al., Radiation Physics and Chemistry, 230, 2025

Figure:

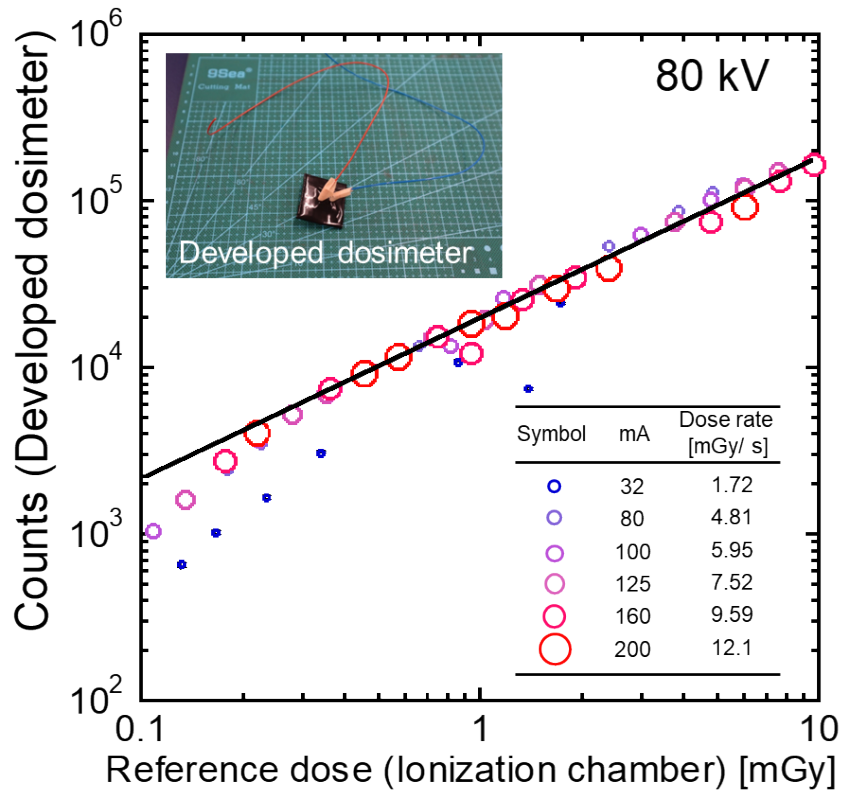


Figure 1 The results of dose linearity and dose rate dependence