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Measurement of ozone concentration at the BL-02A beamline hutch in the Taiwan photon source for ensuring personnel safety

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The Taiwan Photon Source (TPS) BL-02A beamline at the National Synchrotron Radiation Research Center is a curved magnet beamline designed for white light microtomography experiments, wherein biological samples are irradiated with high-energy white light for structural analysis. Experimenters frequently complain of odors when entering the end-station Hutch to change samples, which may be attributed to high concentrations of ozone. Ozone is a toxic gas that is produced when white light radiation reacts with oxygen in the air. Therefore, analyzing the ozone concentration distribution within the Hutch is necessary to evaluate safe windows of time for personnel to enter and the type of personal protective equipment that should be used. The TPS operates at a stored energy and current of 3.0 GeV and 500 mA, respectively, with ventilation air conditioning turned off in the beamline Hutch. We measured ozone concentrations in regions of white light exposure at the front end (15 cm) and rear end (13.5 cm) of the Hutch, with the light source turned on for 300 s and off for 300 s. We placed the detector at different distances above, below, and to the right of the beam center. Our results demonstrated that more ozone was produced when white light was exposed for a longer duration. At any given distance, the highest amount of ozone was generated above the beam center, followed by to the right side and below the beam center. These findings can serve as a reference for evaluating the health and safety of researchers exposed to ozone in their work environments.

Footnotes

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