Development of rapid measurement techniques for Materials Informatics in photofunctional materials

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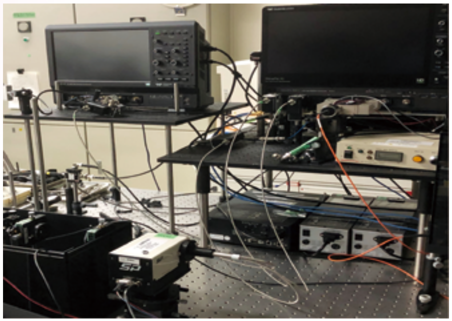
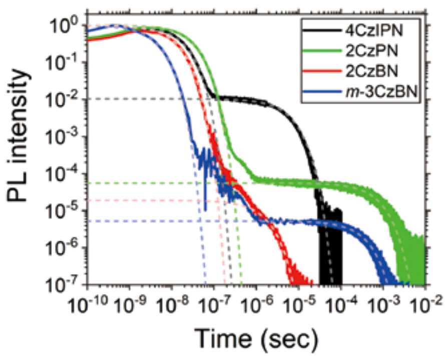
Materials Informatics (MI) presents an innovative approach to forecasting the functionality of novel materials using machine learning. MI can be utilized to develop photofunctional materials such as solar cells, photocatalysts, and light-emitting materials, which are crucial for modern societal progress. To date, MI of photofunctional materials has primarily leveraged only easily obtainable data such as steady-state luminescence/absorption. In contrast, transient photoluminescence/absorption data, which capture the dynamic material properties, remain underutilized owing to insufficient data accumulation as prolonged times and efforts are required for measurements.

NMIJ is dedicated to developing high-throughput measurement techniques for transient photoluminescence by integrating a high-bandwidth real-time sampling method. This method involves a high-speed 12-bit digital storage oscilloscope and a variety of photodetectors. Consequently, we can successfully detect photoluminescence signals in a time range of 0.4 nanoseconds to over a millisecond with a signal dynamic range of over 7 digits within a few minutes. This technology is advantageous over the traditional single photon counting method in terms of the cost of measurement time. It holds great promise as a rapid, high-precision tool for capturing transient response data for photofunctional materials, which can expedite the development of MI-based photofunctional materials.

Reference: M. Furukori et al., *J. Mater. Chem. C* **11**,4357,2023. DOI: 10.1039/D3TC00482A





Photograph of transient photoluminescence apparatus (left) and an example of transient photoluminescence time profile (right)