



Effects of Spin-Coating Conditions on the Optical Properties and Microstructure of Perovskite Thin Films: Implications for Improving Photovoltaic Performance

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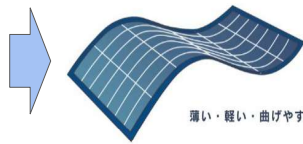
Effects of Spin-Coating Conditions on the Optical Properties and Microstructure of Perovskite Thin Films: Implications for Improving Photovoltaic Performance

Keywords: Perovskite Thin Films, Spin Coating, Optical Properties

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1、Background

- Growing demand for sustainable energy
- Current mainstream silicon-based solar cells face challenges
 - high energy consumption during manufacturing
 - & restrictions on installation conditions
- Perovskite solar cells (PSC) are attracting attention as the next generation of solar cells
 - ↳ Thin and light (one-tenth the weight)
- Highly efficient, but reproducibility of thin-film quality remains a challenge



Source: Asahi Shimbun

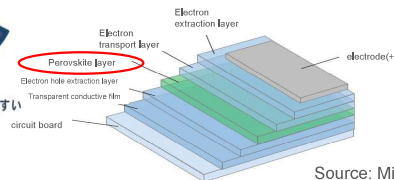
2、Research objectives

In previous research,,,
Researching the changes and effects caused by

- Timing of solution dispensing onto the substrate
- Annealing temperature

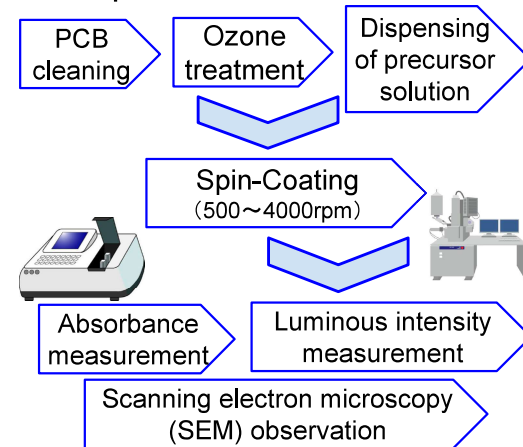
However, nobody research about **rotational speed**

To investigate the effect of spin-coating rotation speed on the **optical properties (absorption and emission)** and **microstructure** of thin films

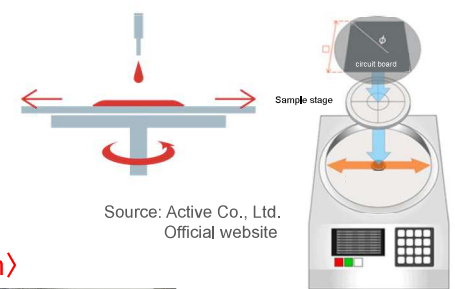


Source: Microjet Co., Ltd. Official website

3、Experimental Method



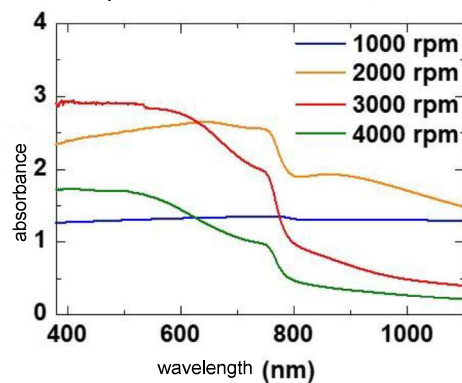
〈What is the spin-coating method〉



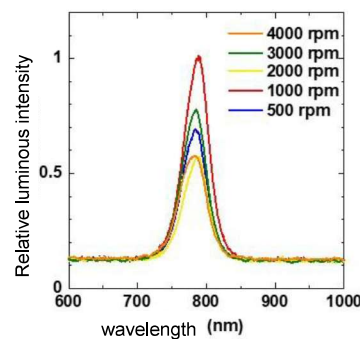
Source: Active Co., Ltd. Official website

4、Experimental results

〈Comparison of absorbance〉



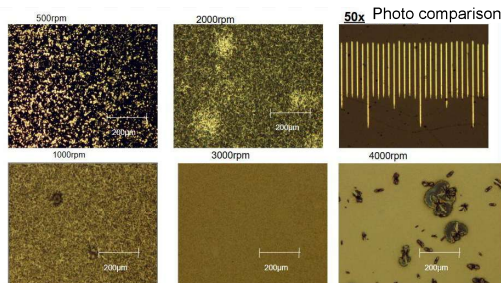
〈Comparison of Luminous Intensity〉



〈Final film〉



〈SEM observation〉



〈Absorption Spectrum〉

- Increase in rotation speed
- Change in film thickness
- Differences in absorption characteristics

〈Luminescence (PL measurement)〉

- Differences in luminescence intensity
- Suggests differences in defect density

〈Photographic Comparison (SEM images)〉

- Variation in grain size
- Differences in surface uniformity

5、Reflections

When the rotational speed changes,,,
the rate of solvent evaporation
& the crystal growth process change

The thin-film structure changes

Affects optical properties

6、Conclusion

The spin-coating rotation speed affects **film thickness, crystal structure, and optical properties.**

By combining absorbance, PL and SEM measurements, it was able to evaluate **film quality** from multiple perspectives.

7、Outlook for the future

- Introduction of X-ray diffraction (XRD) and atomic force microscopy (AFM) to evaluate the crystallinity and surface roughness of thin films more quantitatively
- In this study, the rotation speed was set in 1000-step increments
- This allows for more precise control of film deposition conditions to determine the optimal fabrication conditions
- Evaluation of solar cell performance

〈References〉

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