

N TYPE AlO_x THIN FILMS FABRICATED BY DROP PHOTOCHEMICAL DEPOSITION

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1. BACKGROUND

Aluminum oxide (AlO_x)

- Energy bandgap (E_g) : ~ 9 eV
- High chemical and thermal stability
- Non-toxic and abundant elements
- **Normally, AlO_x is insulator.**

AlO_x films are fabricated by various methods. (CVD, PLD, ALD, etc.)
The films are highly insulating.

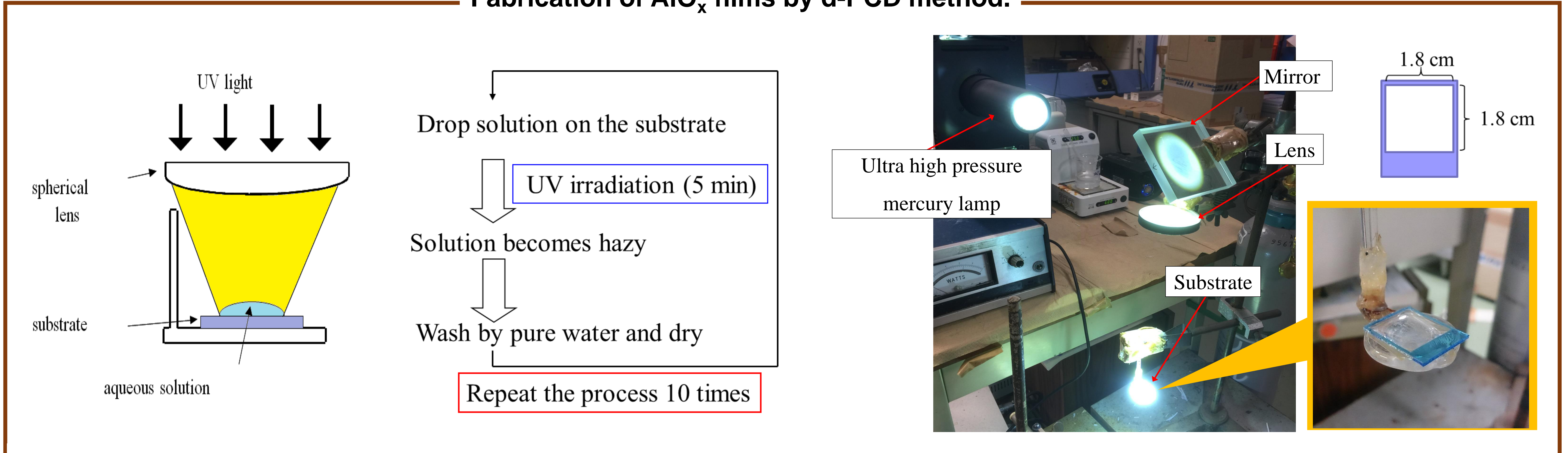
There is no report of fabrication of **conductive AlO_x films.**

In this study,

- We fabricate AlO_x films by drop-photochemical deposition (d-PCD).
- We perform annealing for the films to improve conductivity.

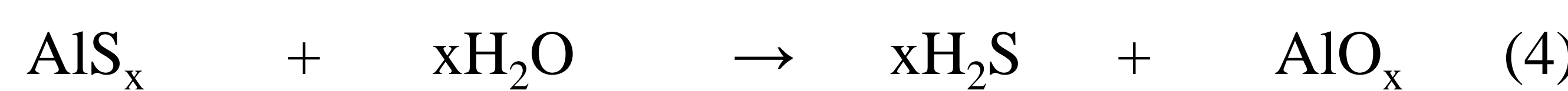
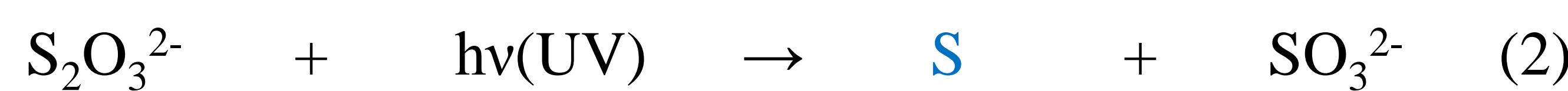
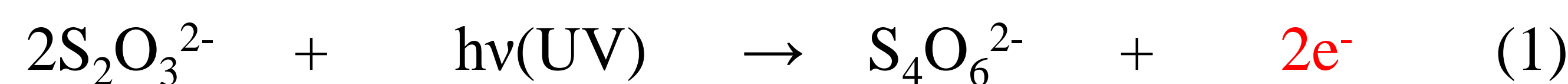
2. EXPERIMENTS

Fabrication of AlO_x films by d-PCD method.



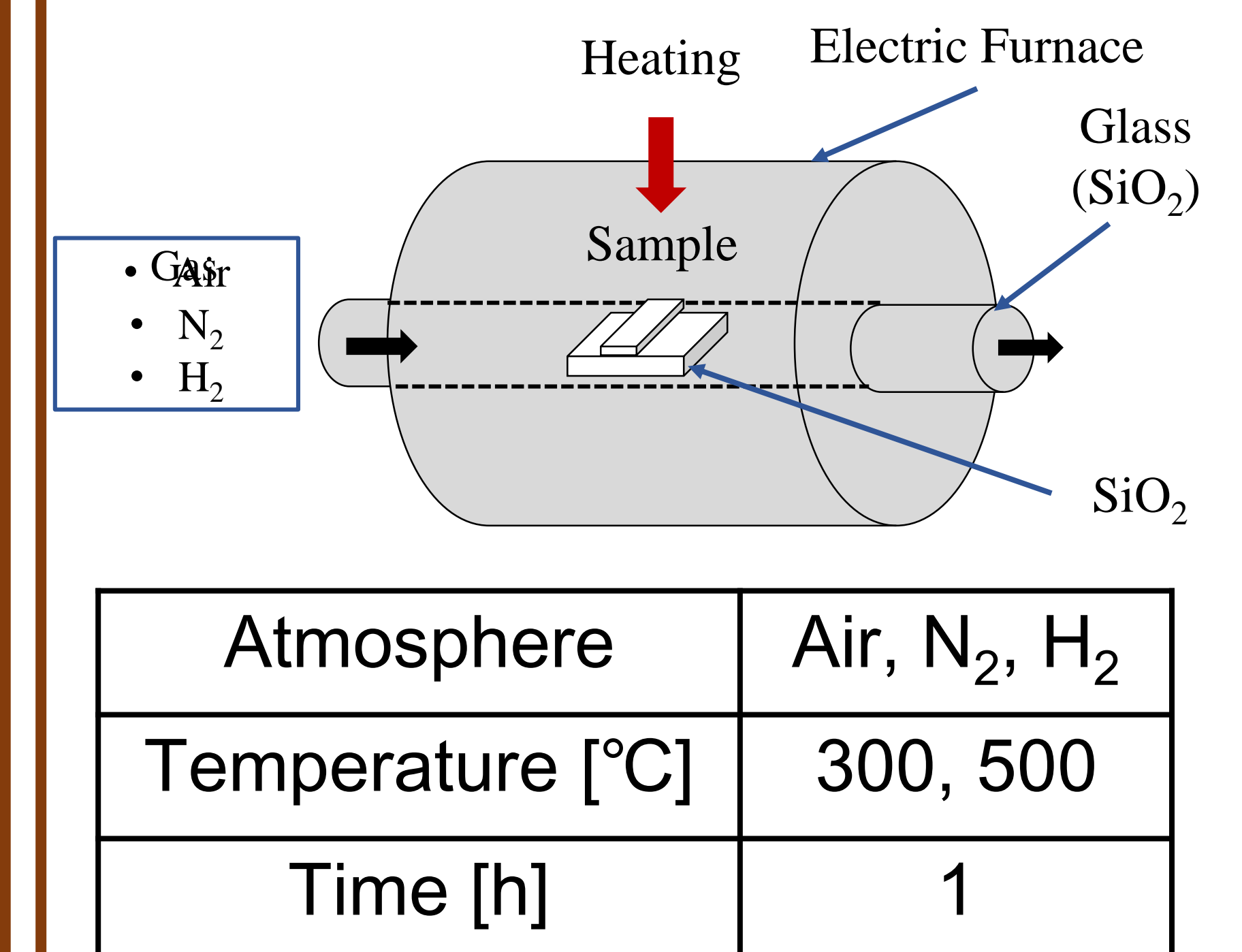
AlO_x Solution Condition

$\text{Al}_2(\text{SO}_4)_3$ [mM]	5
$\text{Na}_2\text{S}_2\text{O}_3$ [mM]	50
Pure water [mL]	50
Light intensity [mW/cm ²]	500
pH	3.6-4.2
Temp. [°C]	25 (RT)
Drop solution [mL]	0.25



$\text{Na}_2\text{S}_2\text{O}_3$ acts as a **reducing agent** and a **source of sulfur**.

Annealing condition



3. RESULTS

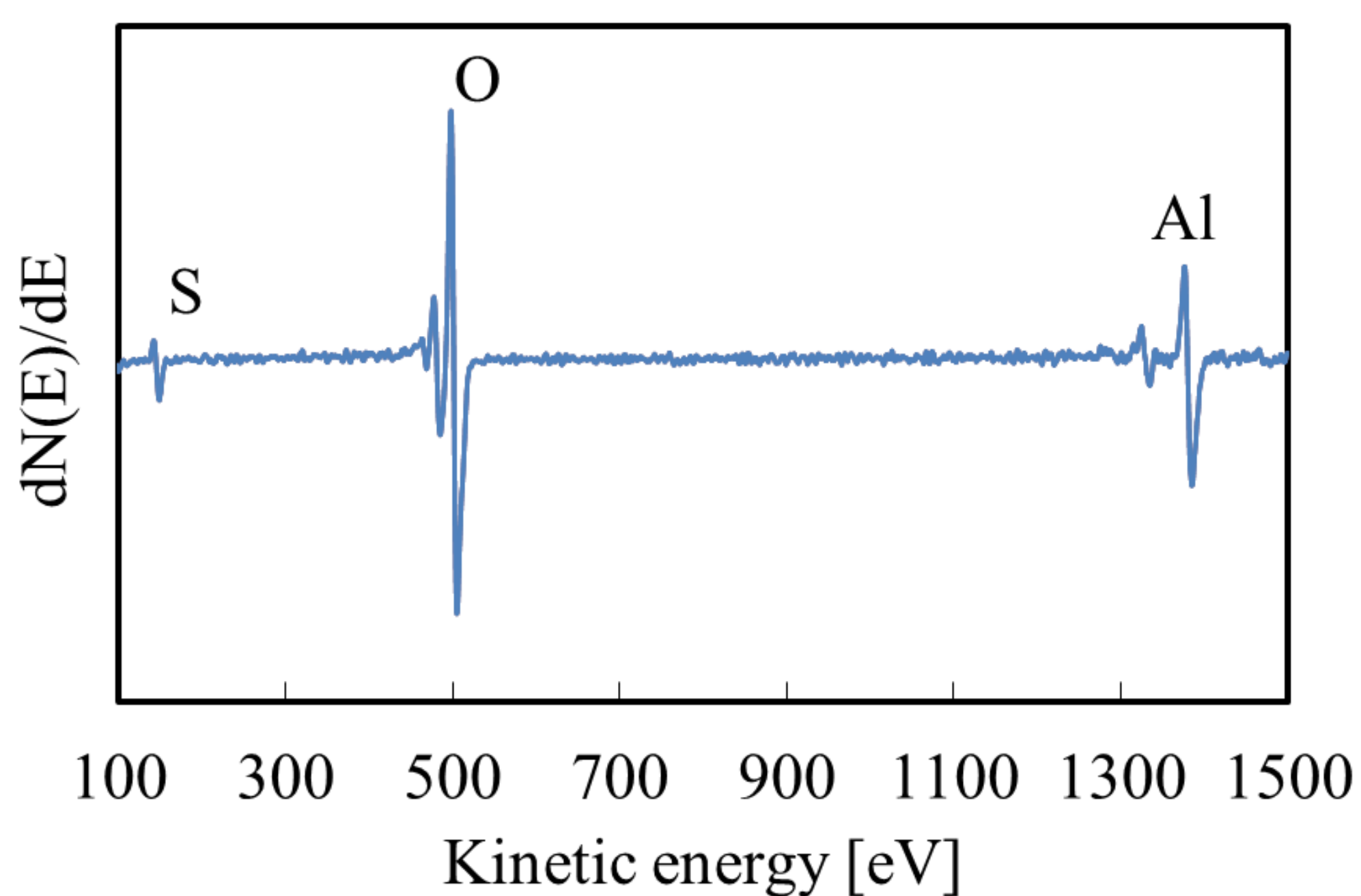


Fig.1 The AES spectrum of As-deposited AlO_x films on FTO (O/Al = 1.1).

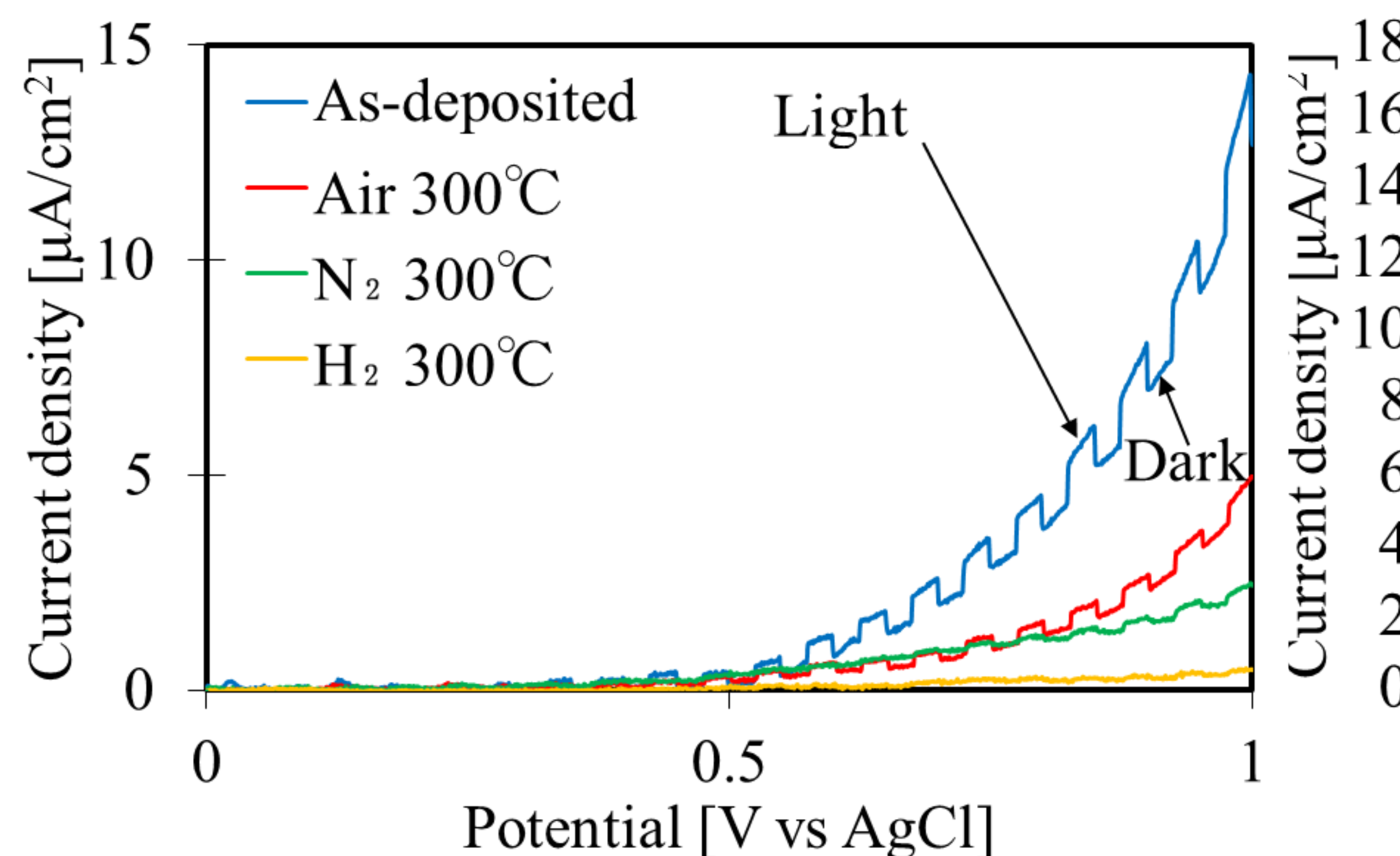


Fig.2 PEC (Photo Electro Chemical) measurement results of as-deposited and annealed samples (300 °C)

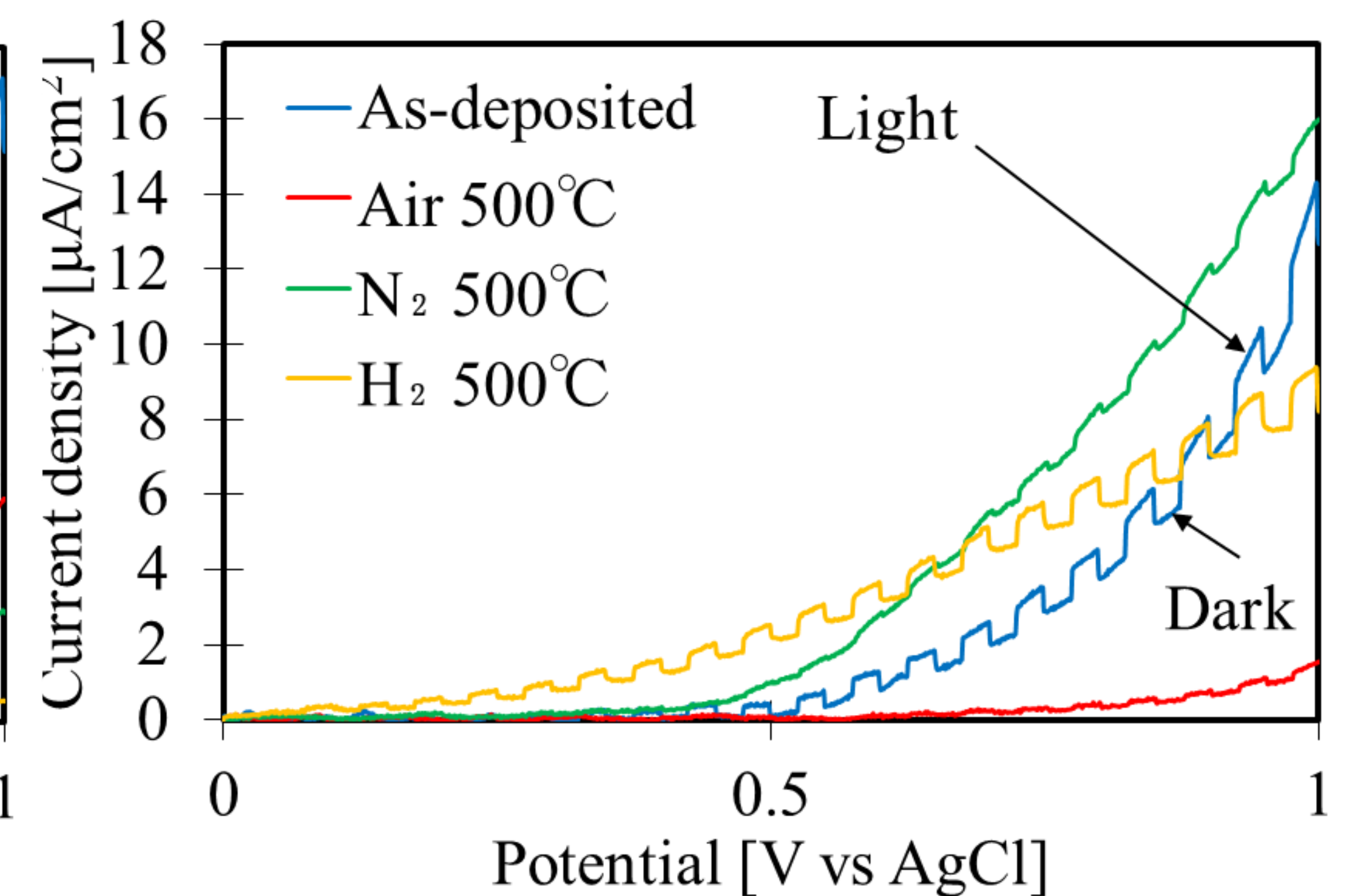


Fig.3 PEC measurement results of as-deposited and annealed samples (500 °C)

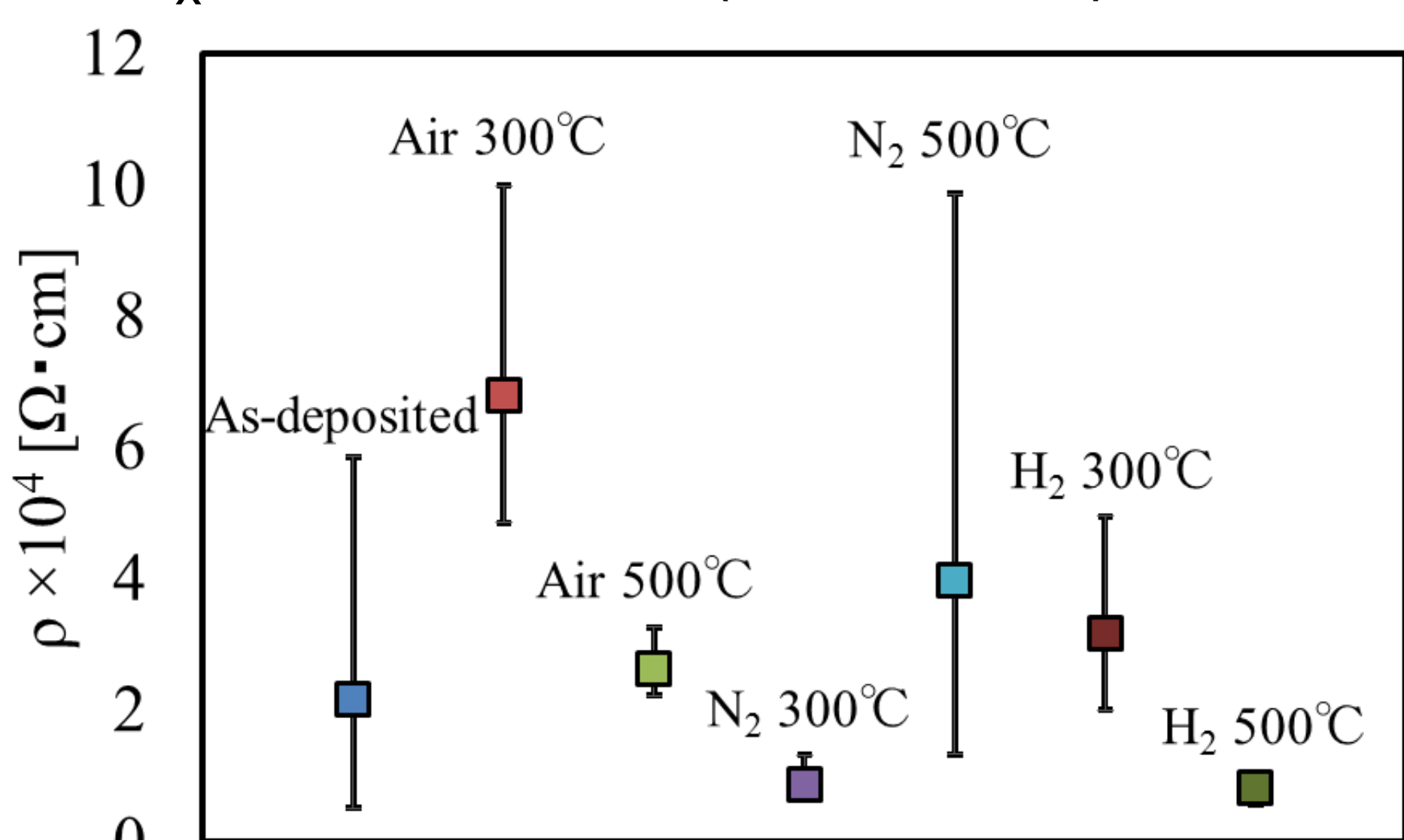


Fig.4 The resistivity of as-deposited and annealed samples on FTO.

4. CONCLUSIONS

- By drop PCD, the AlO_x films are fabricated. The films are composed of Al, O and S. (O/Al = 1.1-1.3, S/Al \cong 0.02)
- The films have n-type conductivity. The (photo)conductivity is not improved by annealing.
- The resistivity of the films are $5 \times 10^4 - 1 \times 10^6 \Omega\text{cm}$.