

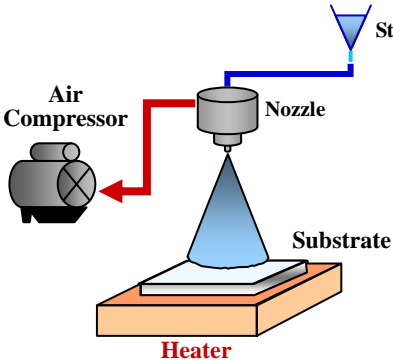


# Spray Pyrolysis Deposition for Thin-Film Formation and Its Application to DSC Study

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## What is SPD for Thin Film Formation

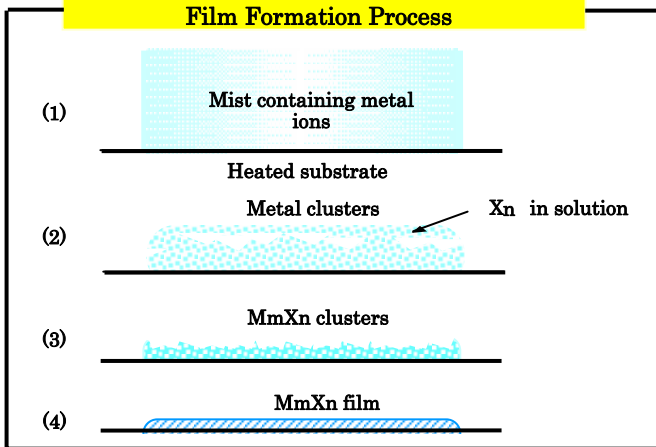
### Spray Pyrolysis Deposition (SPD) Method



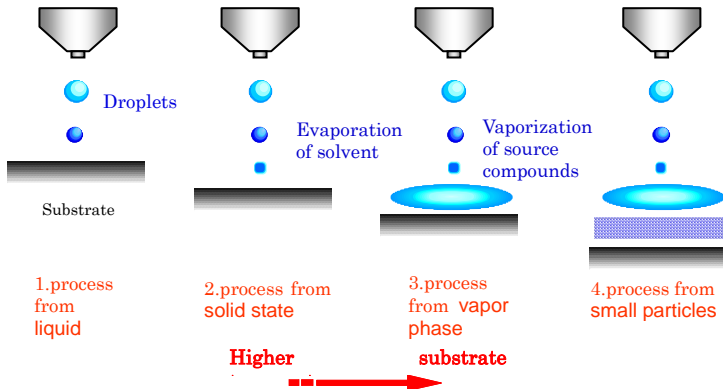
- Characteristics**
1. Film formation by a simple apparatus in air
  2. Application to large substrates (~30cm × 30cm)
  3. Various source solutions
  4. Low temperature synthesis
  5. High growth rate

A solution containing starting compounds is atomized not continuously but intermittently by a pneumatic spraying system, since the substrate temperature is lowered by spraying the solution with compressed air. It thus takes several seconds for the next spray until the temperature will recover. Droplets are transported onto a substrate of 25 mm×25 mm×1 mm in size that is heated up to the prescribed temperature.

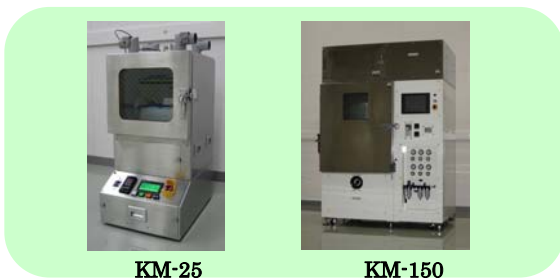
### Film Formation Process



### Spray Pyrolysis Processes in Reaction Chamber



### SPD Apparatus



## FTO Glass and DSC Module

### 150 mm × 150 mm FTO

80	80	80	80	81
80	81	81	81	81
81	81	80	81	81
81	81	81	81	81
81	81	81	81	80

Average : 80.7%

(a) Transmittance of visible light

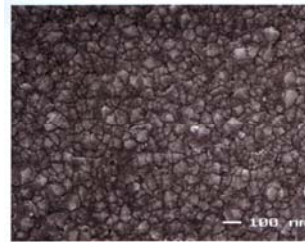
5.9	6.1	6.1	6.4	6.8
6.1	5.9	5.8	6.1	6.9
6.3	6.2	6.6	6.4	6.5
6.6	6.7	6.9	6.6	6.6
6.7	6.8	6.7	6.5	6.7

Average : 6.4 Ω/□

(b) Sheet resistance

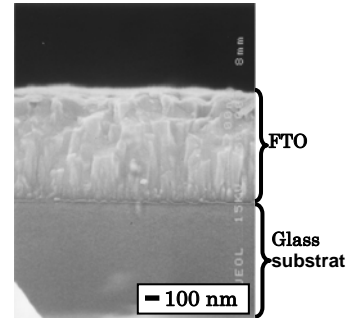
### SEM Photographs of FTO

#### Surface morphology



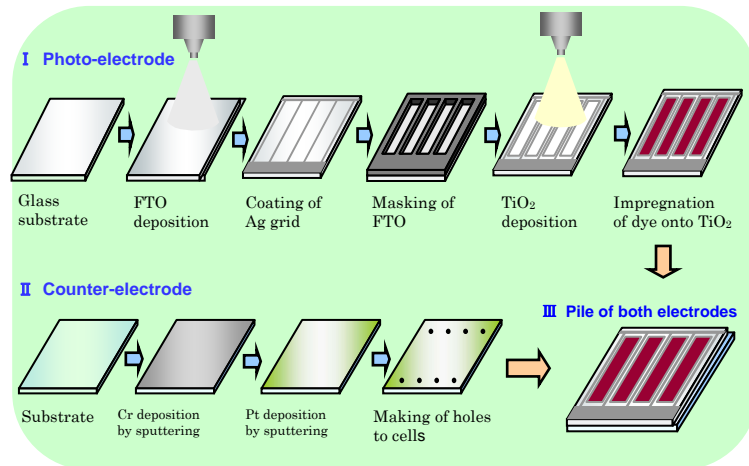
Grain size ~ 50 nm

#### Cross section



Film thickness ~500 nm

### Fabrication Process of DSC Module



### Photovoltaic properties of DSCs

