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## 境外生研究獎學金

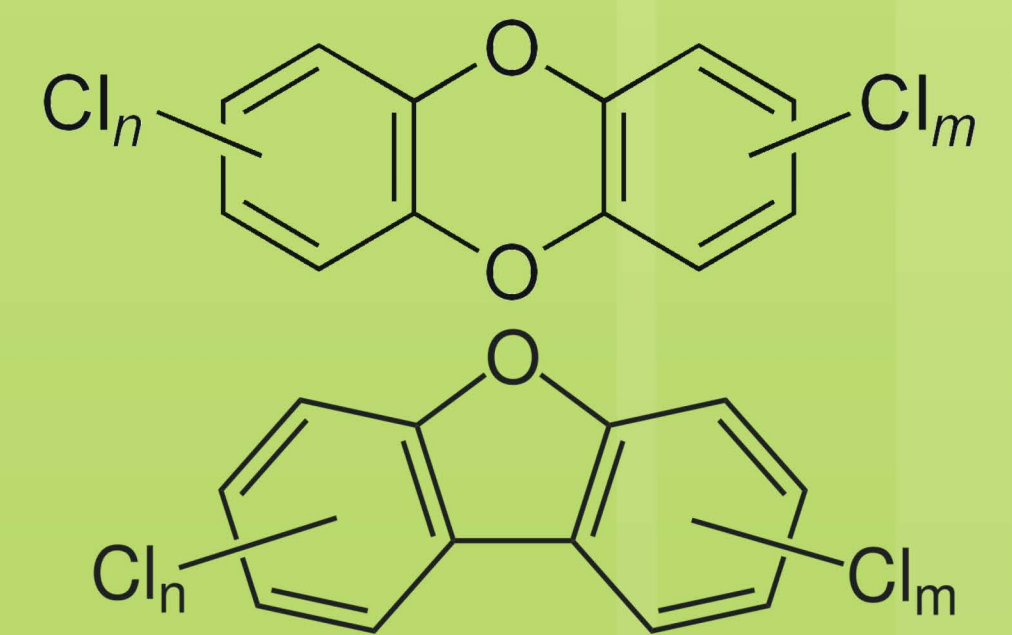
Research Scholarship for International Graduate Students



### Catalytic pyrolysis: New approach for destruction of POPs in MWIs fly ash

Minh Man Trinh, Moo Been Chang\*

Graduate Institute of Environmental Engineering, National Central University, Chungli, Taiwan



#### Introduction

- 200,000 tons of fly ash (FA) is generated from municipal waste incinerator every year in Taiwan.
- Reuse of FA is limited due to high concentration of Dioxins (PCDD/Fs and dl-PCBs).
- Traditional pyrolysis for FA treatment requires long time and high energy.

#### Research focus

- Apply washing process to FA for chloride removal.
- Evaluate the effect of traditional pyrolysis after washing process.
- Apply palladium as catalyst to reduce PCDD/Fs and dl-PCBs concentration

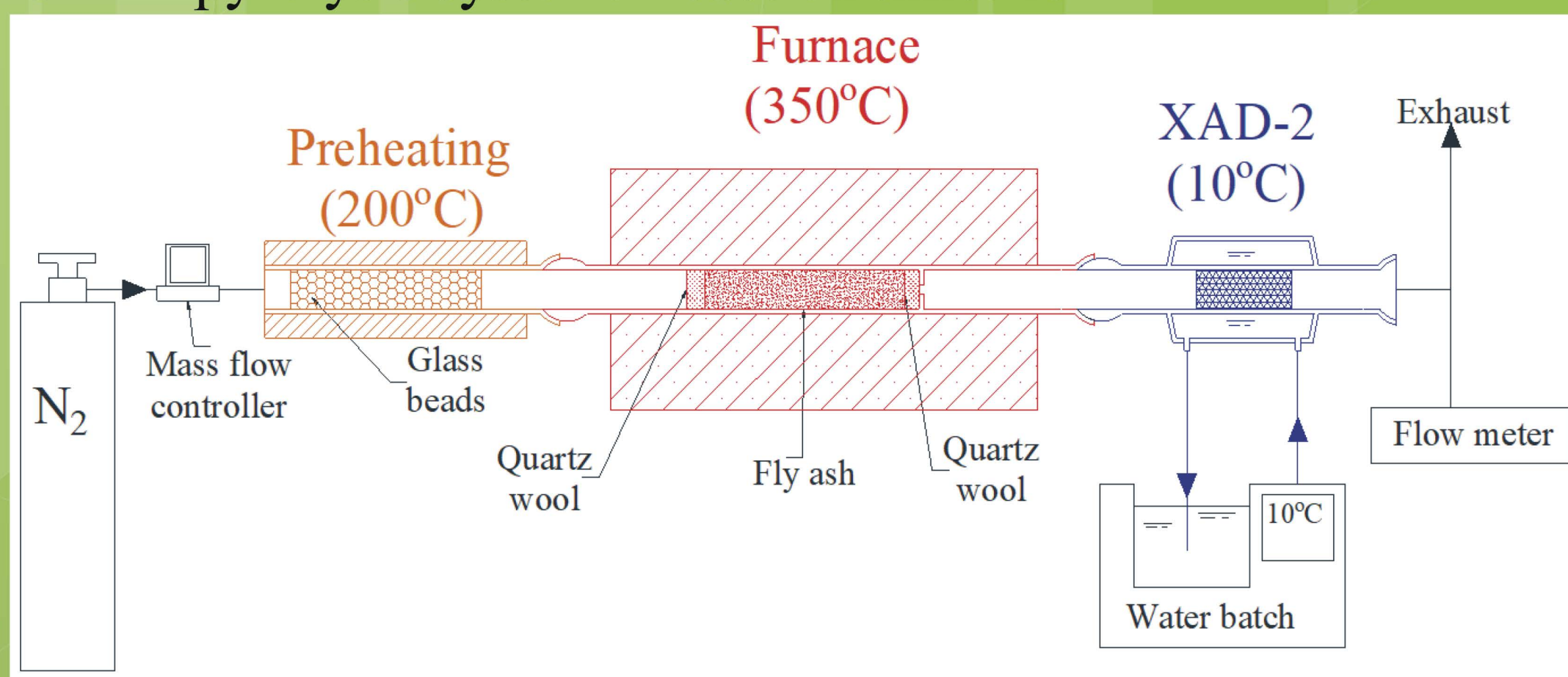
#### Experiment

- Water washing (WWFA)



- 20 g FA
- Water : FA ratio is 5:1
- 200 rpm
- Room temperature
- 5 min

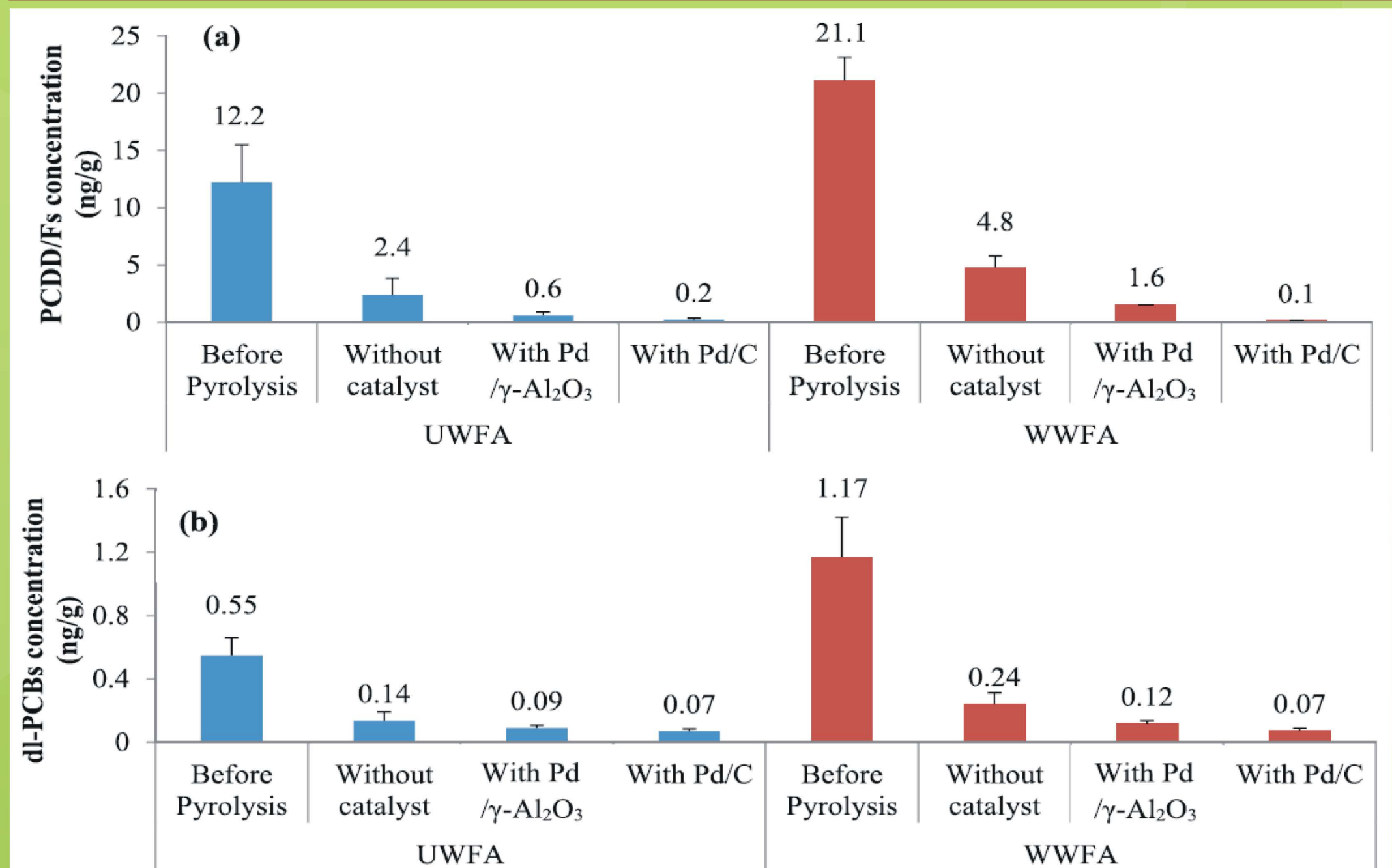
- FA pyrolysis system: Reaction time: 15 min



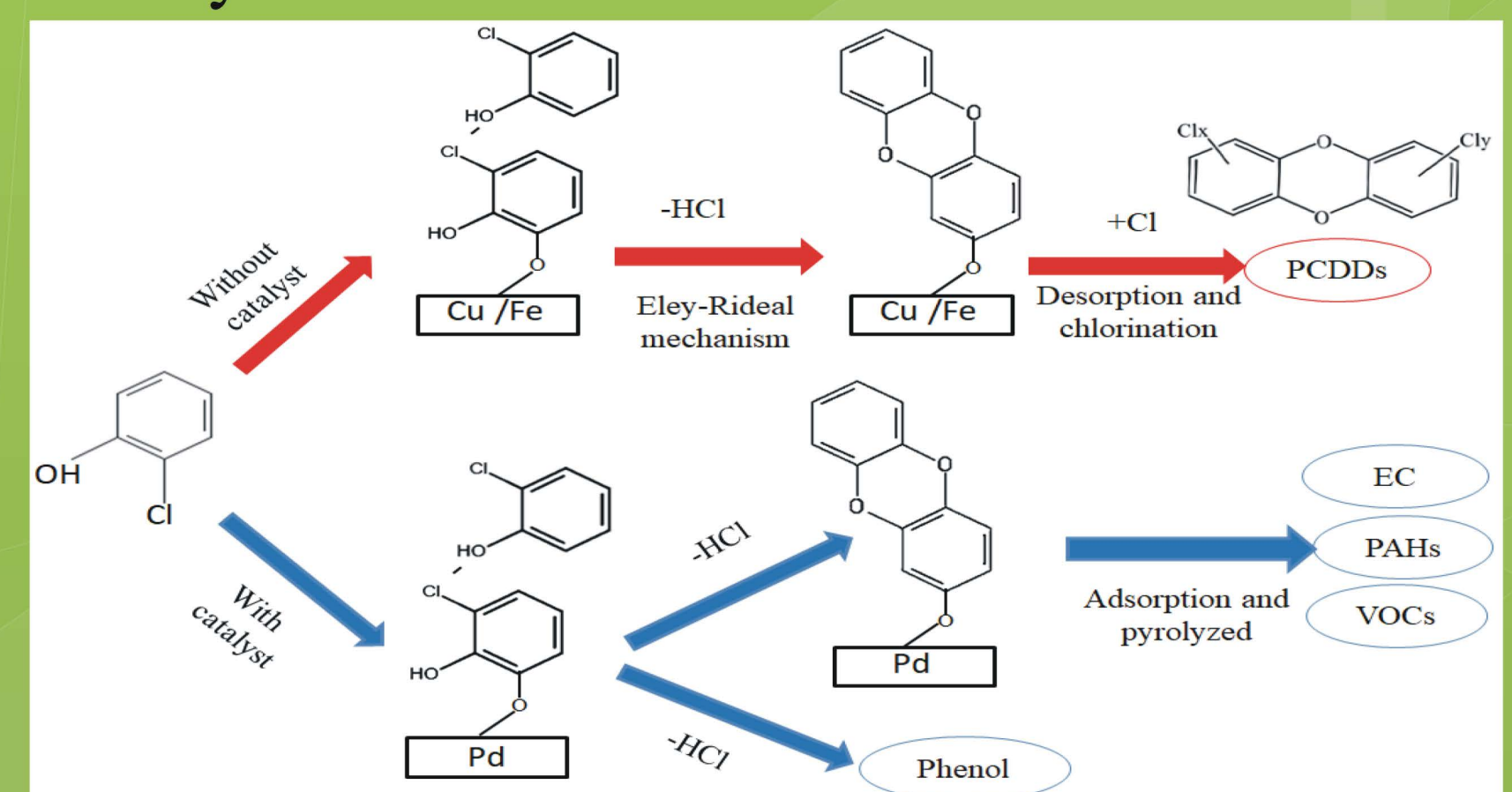
- Catalyst characteristic

Powder catalyst	Pd/ $\gamma$ -Al <sub>2</sub> O <sub>3</sub>	Pd/C
Pd %	5	5
Surface area (m <sup>2</sup> /g)	80.97	405
Pore Volume (cm <sup>3</sup> /g)	0.19	0.37
Average Pore Size (Å)	94.9	36.9

#### Results and discussion



- After being pyrolyzed at 350 °C without catalyst for 15 min, PCDD/Fs concentrations in unwashed FA (UWFA) and WWFA reduced 80.5% and 77.3%, respectively
- With the addition of Pd / $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, PCDD/Fs concentrations in UWFA and WWFA are reduced 95.1% and 92.6%, respectively.
- With the addition of Pd/C, PCDD/Fs measured in UWFA and WWFA are further reduced 98.3% and 99.4%, respectively.



- Increases of PCDD/Fs and dl-PCBs destruction efficiencies by pyrolysis combined with catalysis could be ascribed to the inhibition of precursor formation at 200–300 °C by Pd.

#### Publication

- Trinh, M.M. and Chang, M.B., Catalytic pyrolysis: New approach for destruction of POPs in MWIs fly ash. Chemical Engineering Journal, 2021. 405: p. 126718



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