

La-doped ATaO₃ for the Photocatalytic Degradation of PFAS

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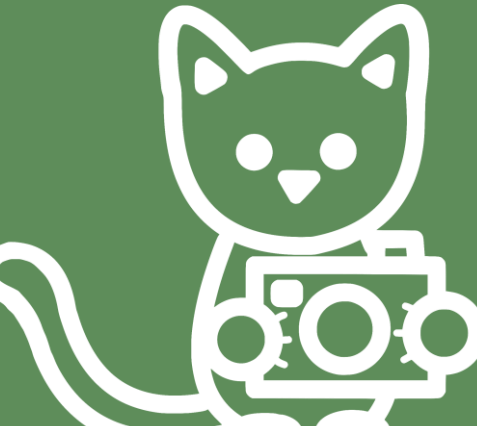


PHOTO-CAT
GROUP

Methyl Orange

Structure

Colour

Analysis UV-Vis

Toxicity

PFAS

Structure

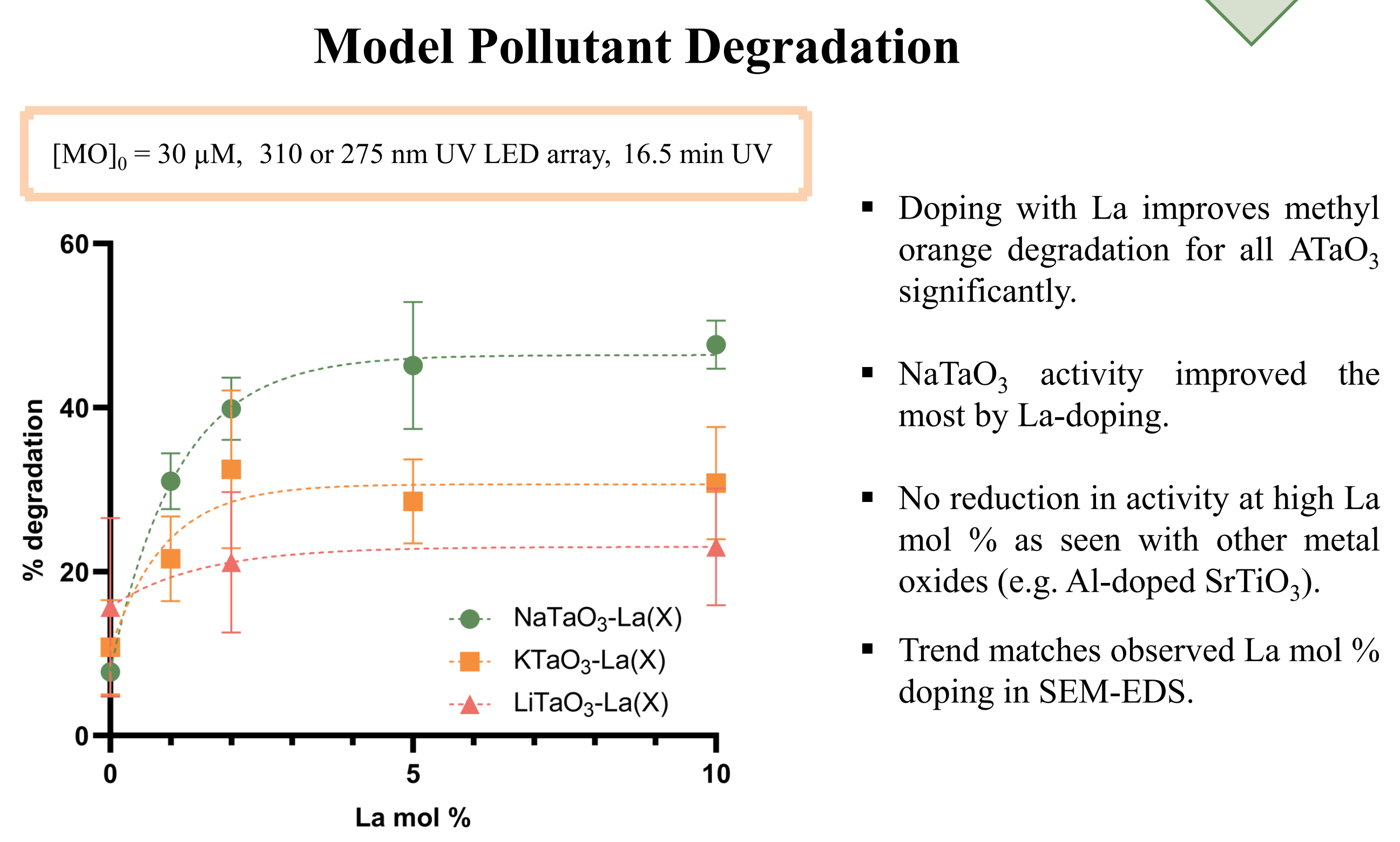
Colour

LC-MS Analysis

Toxicity

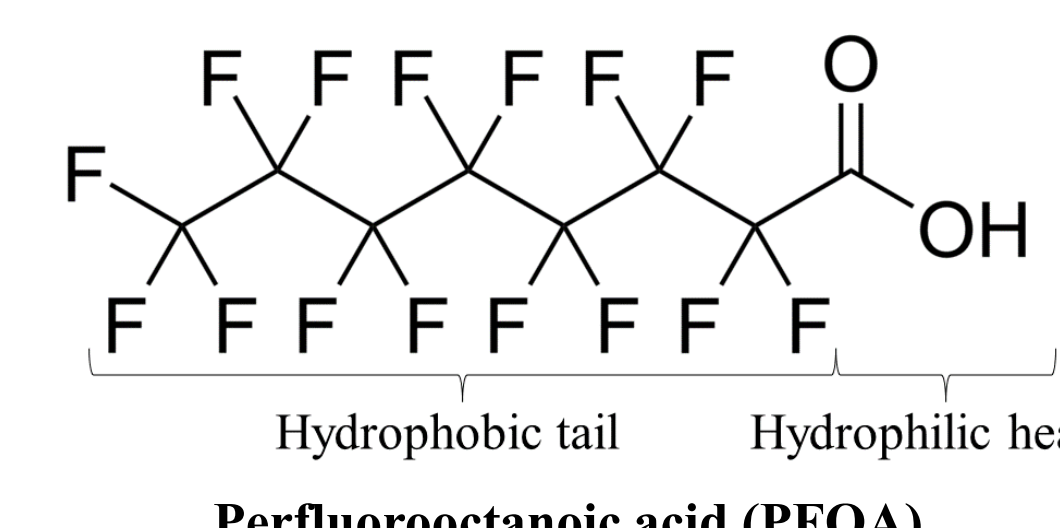
UV resistance

Anionic



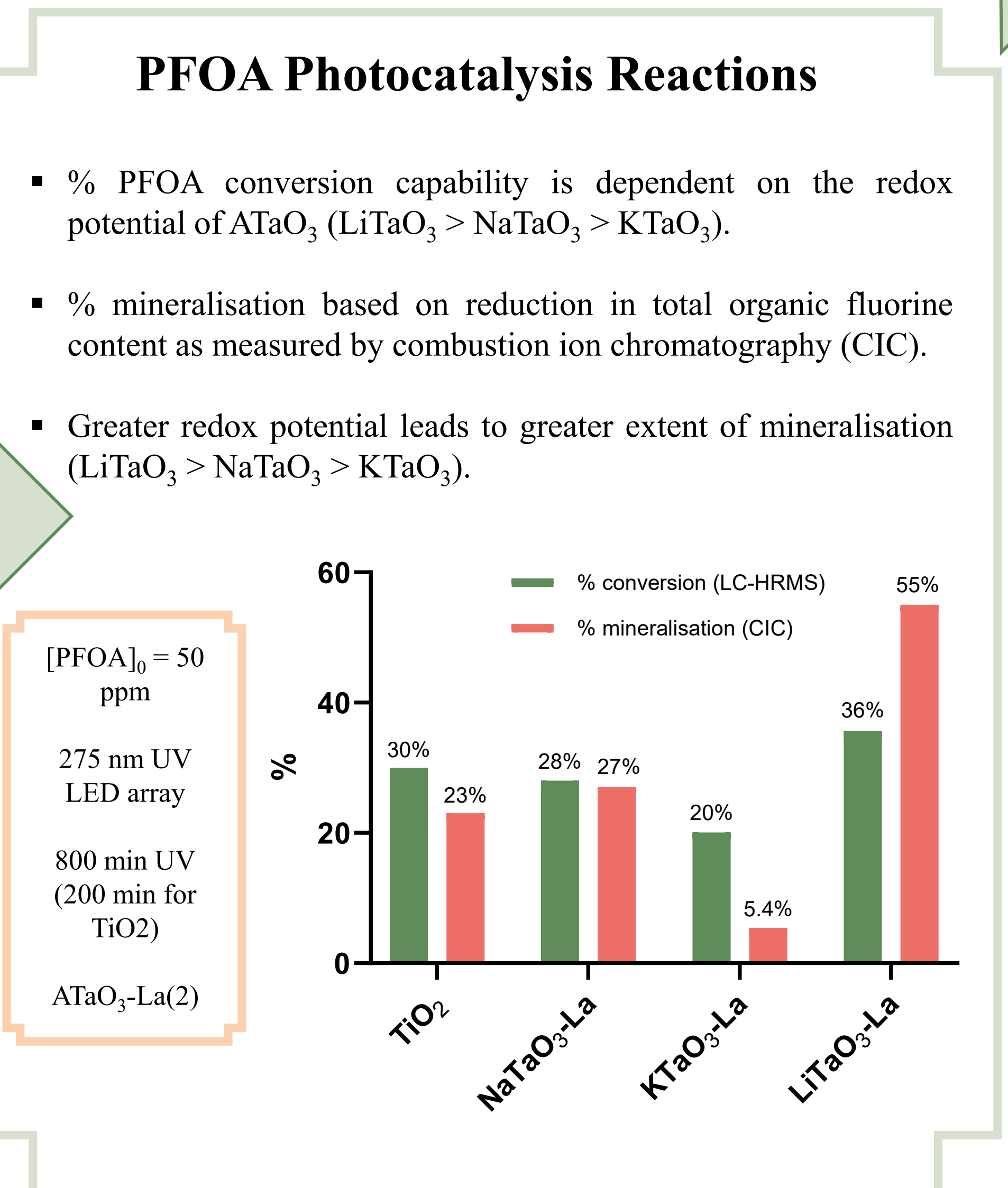
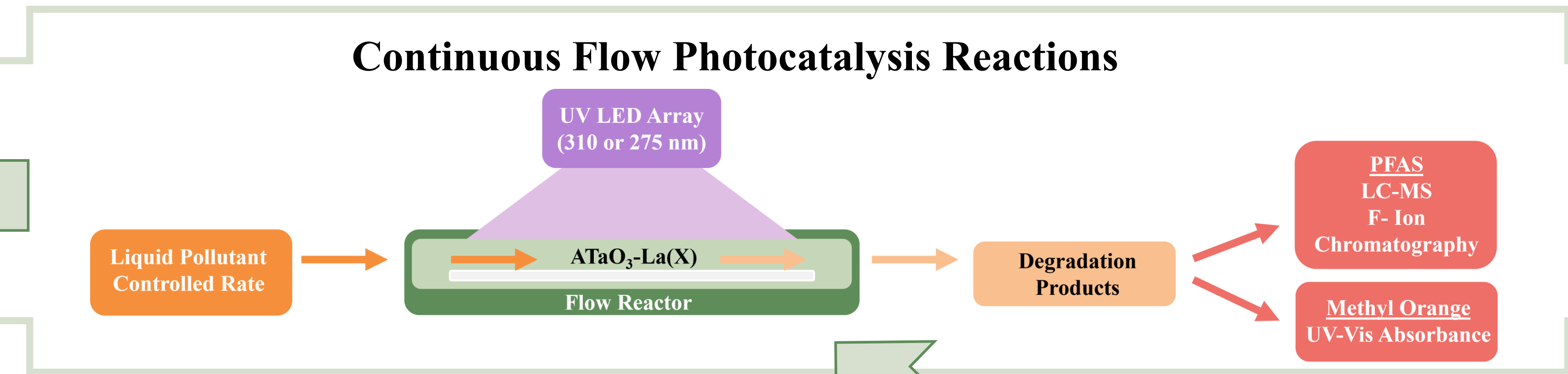
Per- or Polyfluoroalkyl Substances (PFAS)

- Group of fluorinated chemicals with useful properties.
- Both hydrophobic and hydrophilic with strong C-F bonds that are resistant to biodegradation.
- Current destruction techniques (combustion) are ineffective for PFAS degradation.¹
- 8,300 tonnes of PFAS firefighting foams stored in Australia alone.²
- Detrimental effects on health and environment.
- 3 compounds listed as Persistent Organic Pollutants in the Stockholm Convention.



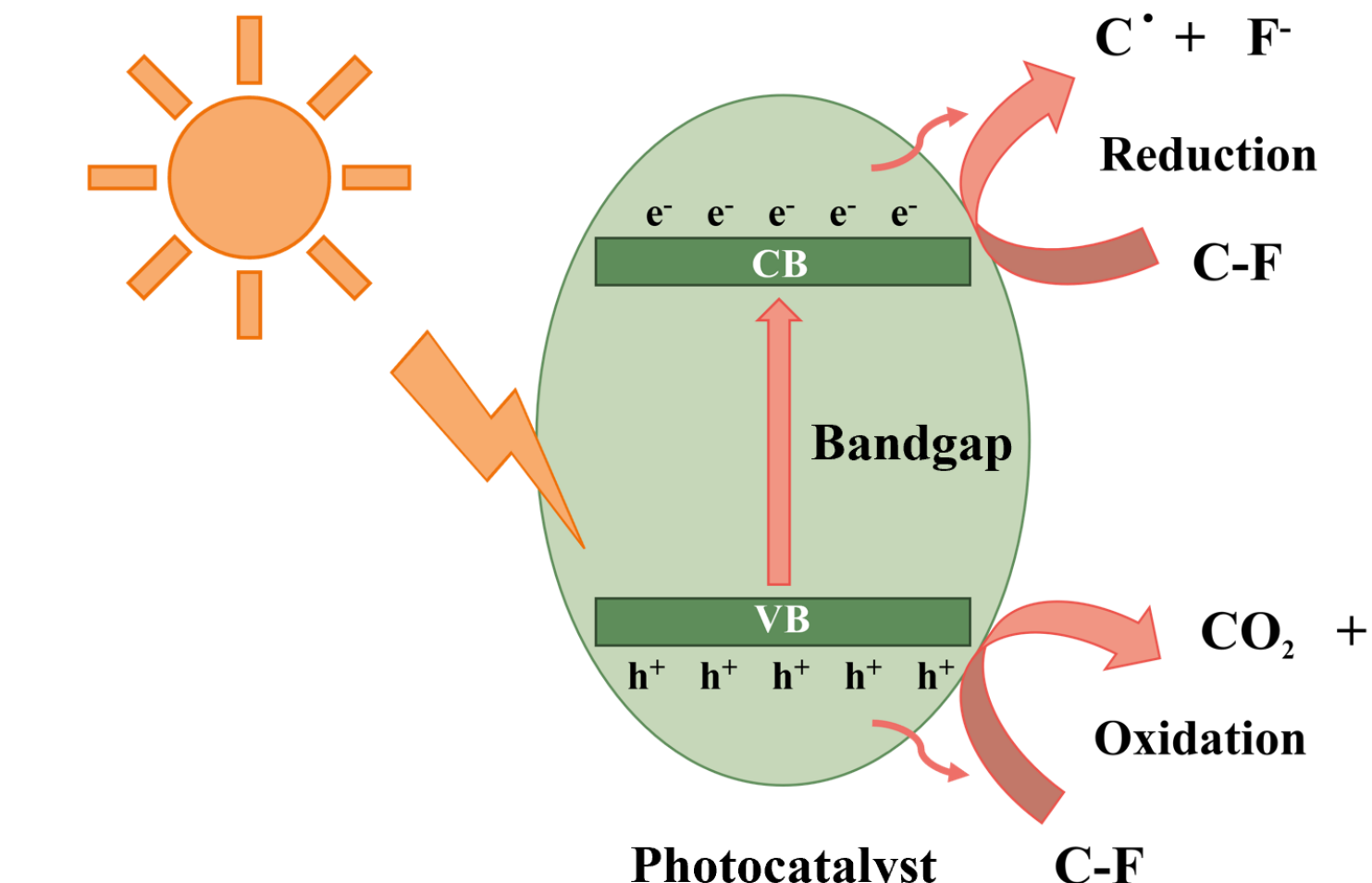
Hydrophobic tail Hydrophilic head

Perfluorooctanoic acid (PFOA)



Photocatalysis for PFAS Degradation

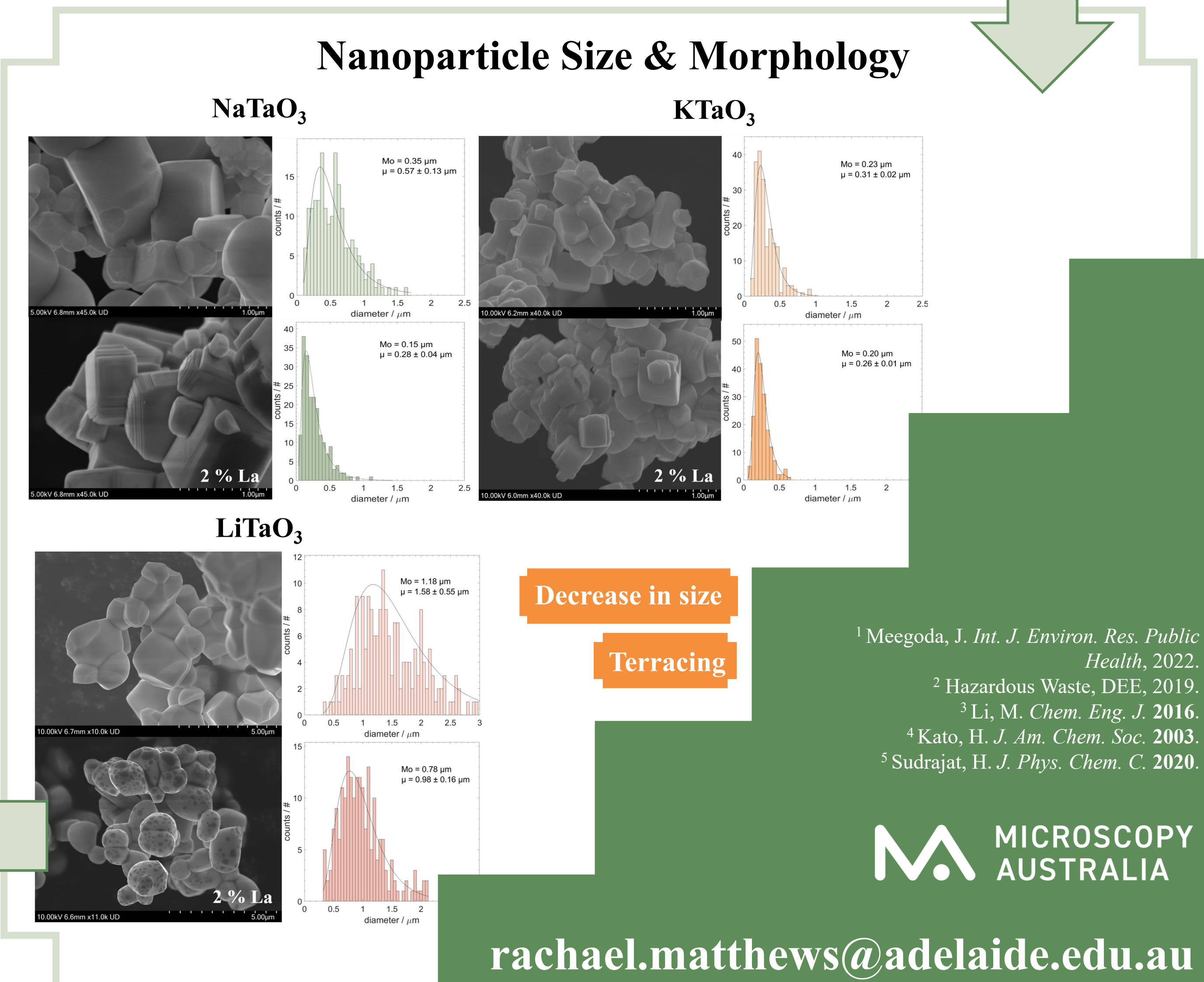
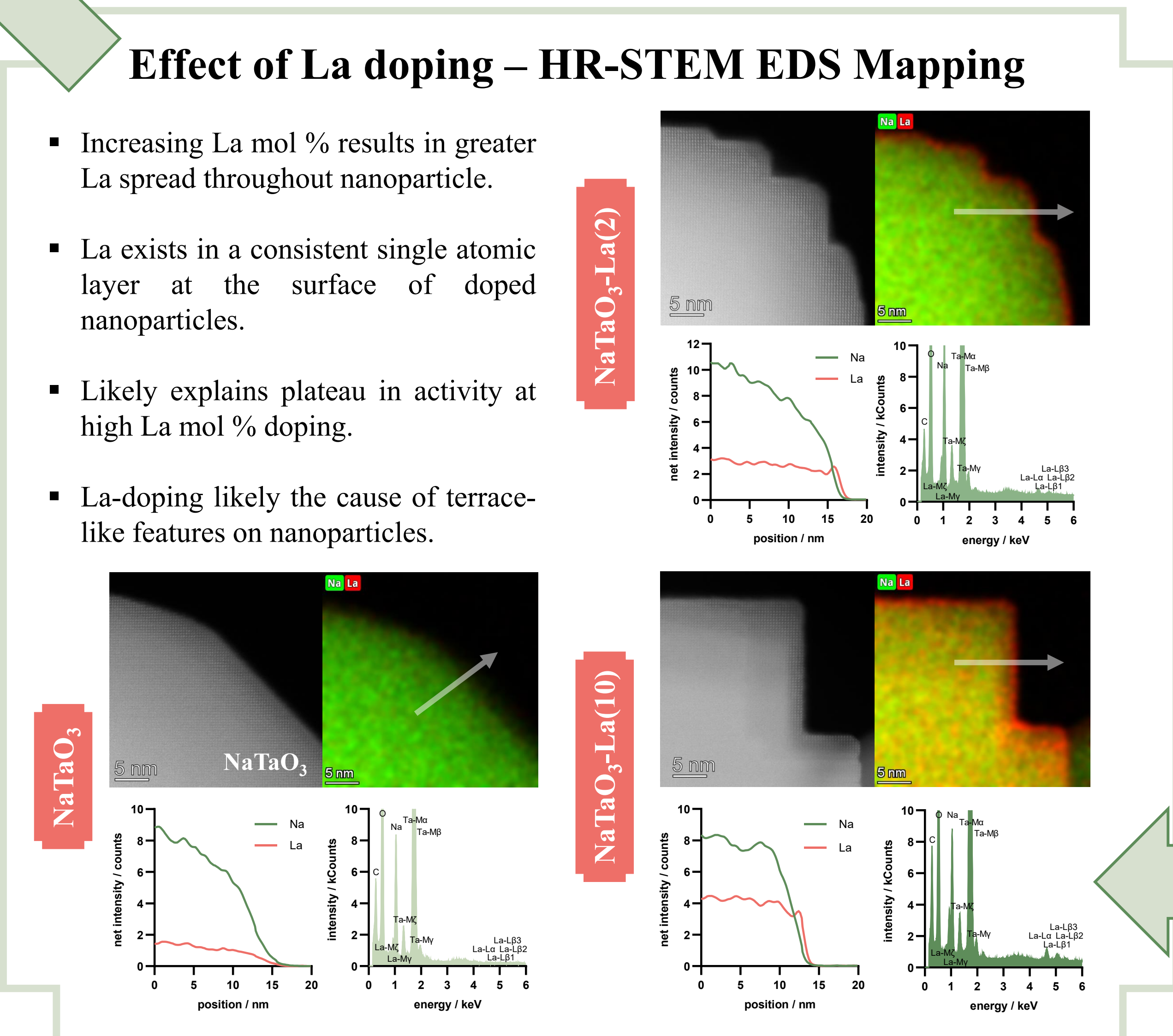
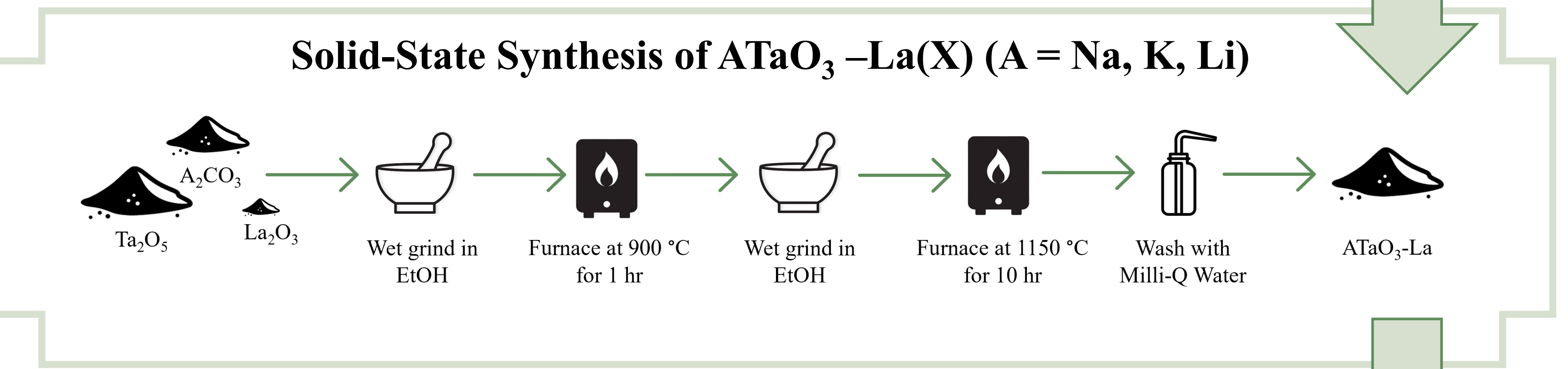
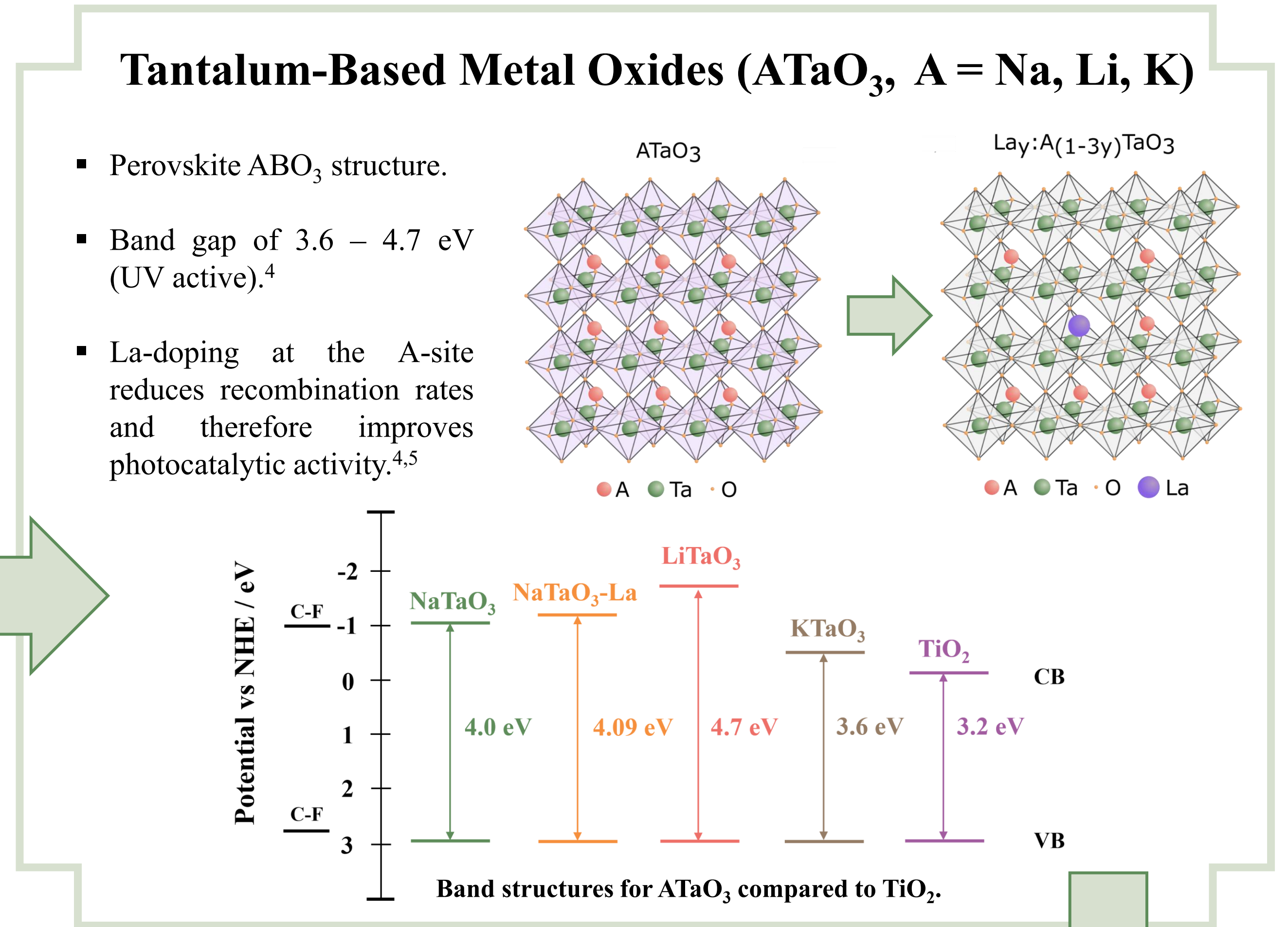
- Materials that absorb light can be used to drive chemical reactions.
- Typically use semiconductors due to energy difference between occupied conduction band and vacant valence band (e.g. TiO₂).
- 100 % PFAS conversion and 34.8 % mineralisation can be achieved with TiO₂ under UV irradiation.³



Reduction: C* + F⁻

Oxidation: CO₂ + F*

Photocatalyst



¹ Meegoda, J. *Int. J. Environ. Res. Public Health*, 2022.
² Hazardous Waste, DEE, 2019.
³ Li, M. *Chem. Eng. J.* 2016.
⁴ Kato, H. *J. Am. Chem. Soc.* 2003.
⁵ Sudrajat, H. *J. Phys. Chem. C*. 2020.