

Destruction of Emerging Contaminants in Water: Promises and Challenges of Catalytic Ozonation Technology

Presented by:

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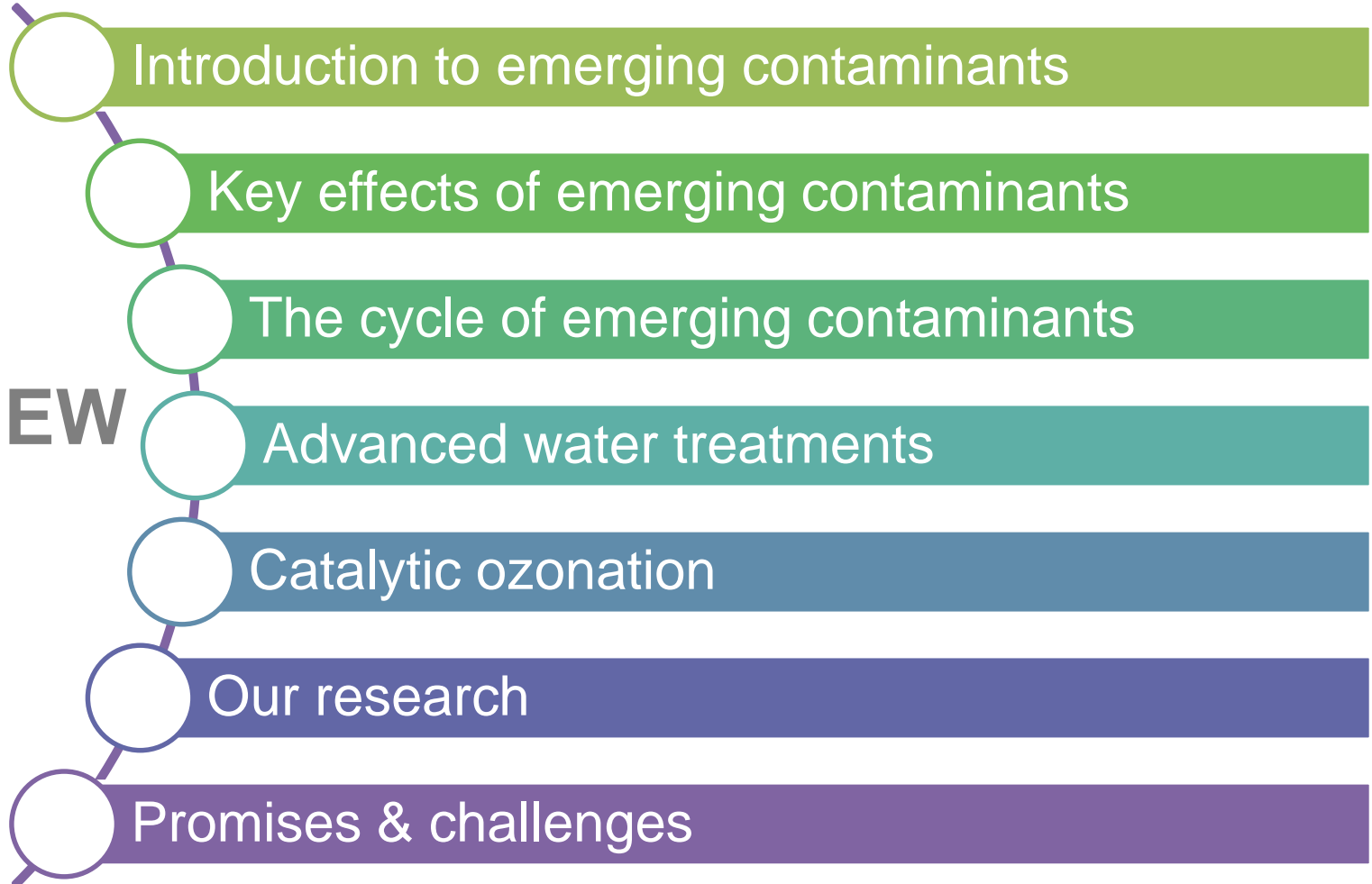
EnviroTech

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OVERVIEW



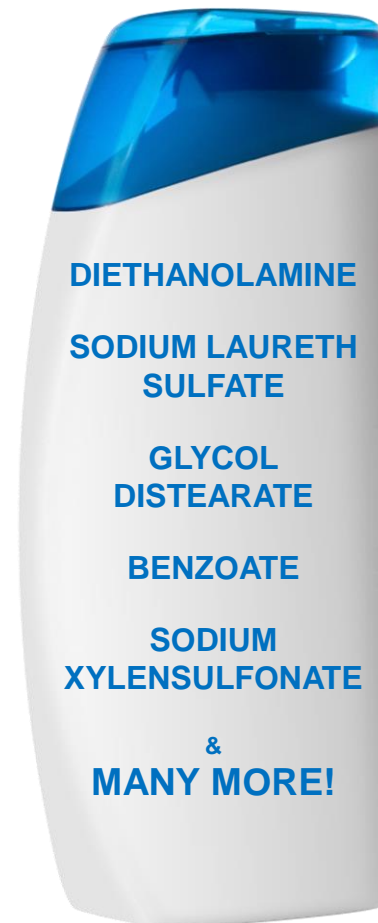
FRESHWATER VERTEBRATE POPULATION DECLINED BY 81% SINCE 1970

12 THREATS TO FRESHWATER BIODIVERSITY



- Changing climates
- E-commerce and invasions
- Infectious diseases
- Harmful algal blooms
- Expanding hydropower
- **Emerging contaminants**
- Engineered nanomaterials
- Microplastic pollution
- Light and noise
- Freshwater salinization
- Declining calcium
- Cumulative stressors

EMERGING CONTAMINANTS: PHARMACEUTICALS & PERSONAL CARE PRODUCTS (PPCPs)



EMERGING CONTAMINANTS: PESTICIDES & HERBICIDES



Omethoate

2,4-dichlorophenoxyacetic acid

N, N-diethyl-m-toluamide

Diazinone

Mecoprop

&

MANY MORE!!!

EMERGING CONTAMINANTS: SOME EFFECTS

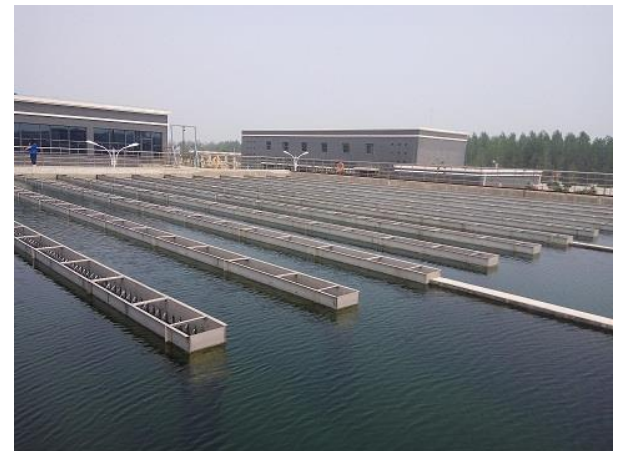


Pharmaceuticals

- Endocrine disruptor
- Help evolve superbugs

**Due to un-metabolised antibiotics
WTPs breed superbugs**

A 'Post-antibiotic World?', www.wateronline.com



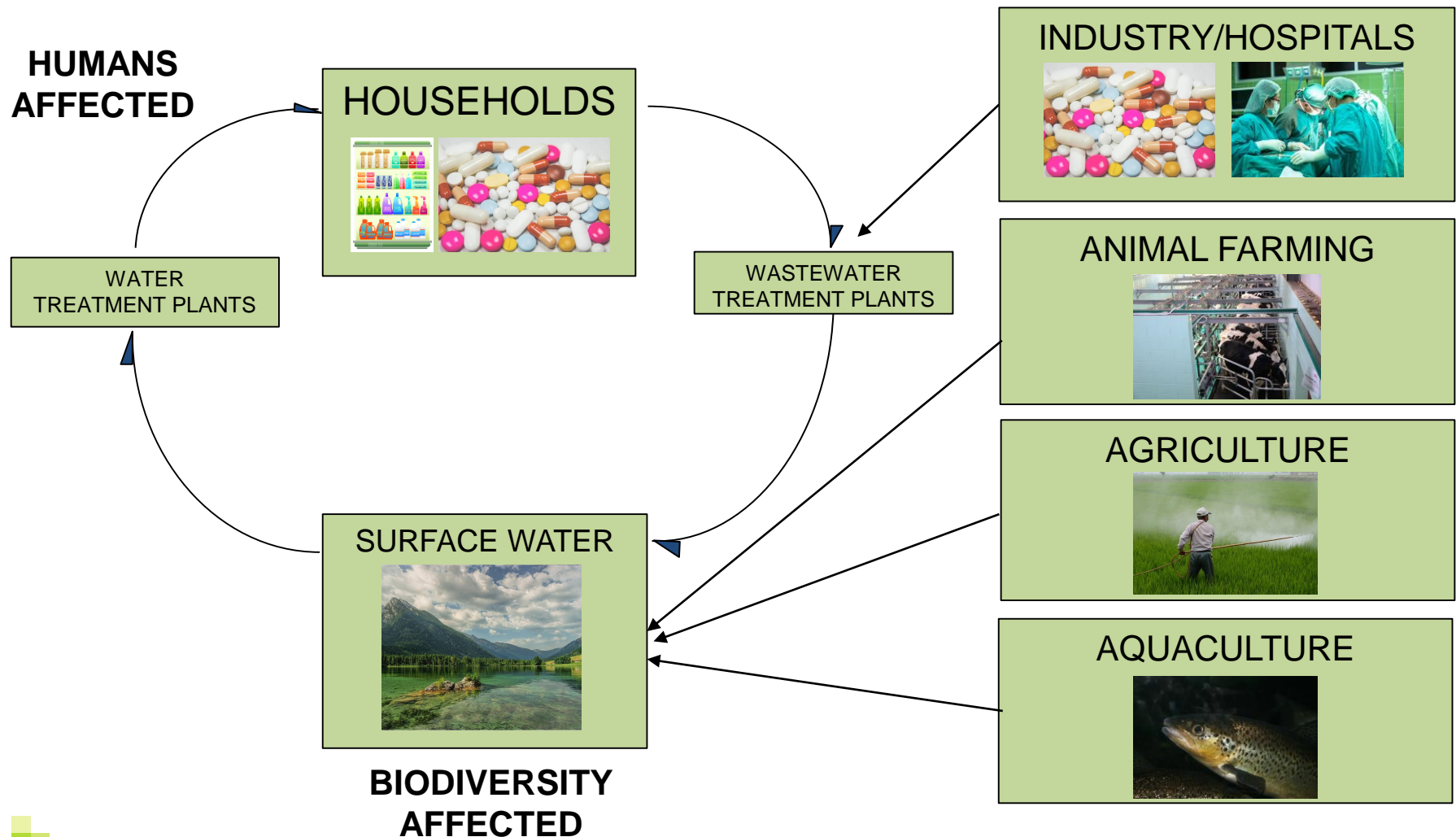
EMERGING CONTAMINANTS: SOME EFFECTS

SOME PPCP CHEMICALS

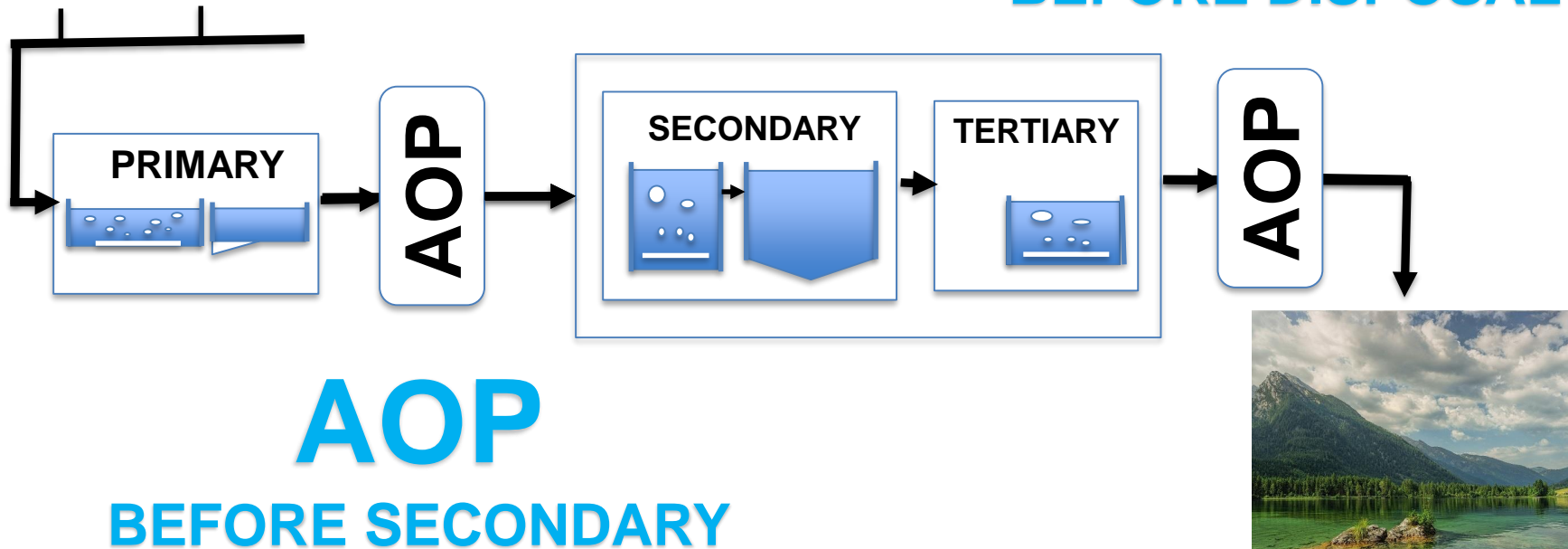
but not limited to

MATERIALS	SOURCES	EFFECTS	REGULATIONS CANADA
Diethanolamine	Soaps, cleansers & shampoos	Carcinogen & toxic	Unregulated
Parabens	Cosmetics	Mimic estrogen	Unregulated
Polyethylene glycols	Cosmetics	Carries dioxane	Unregulated
Petrolatum	Moisturizers, hair products	Carries polycyclic aromatic hydrocarbons	Unregulated

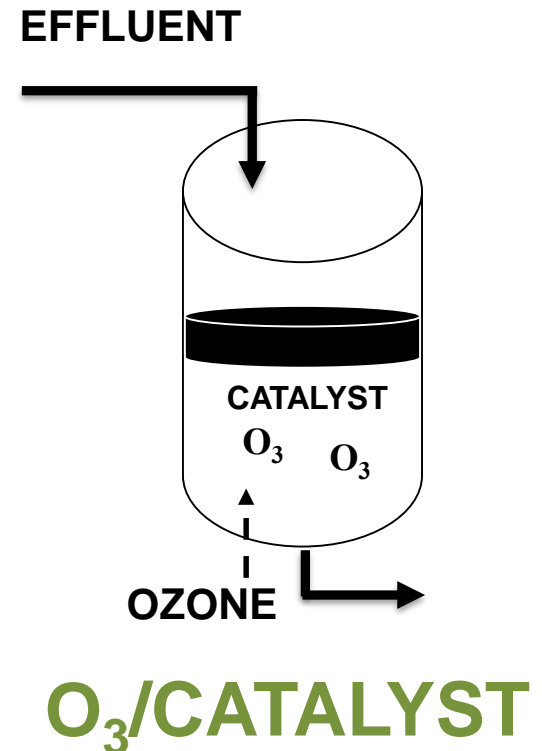
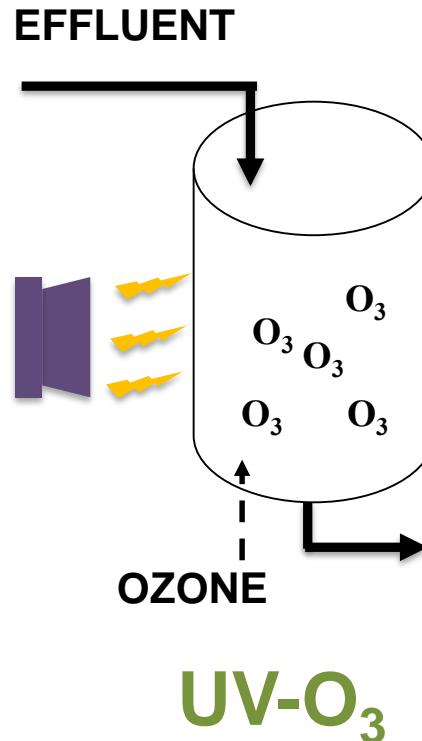
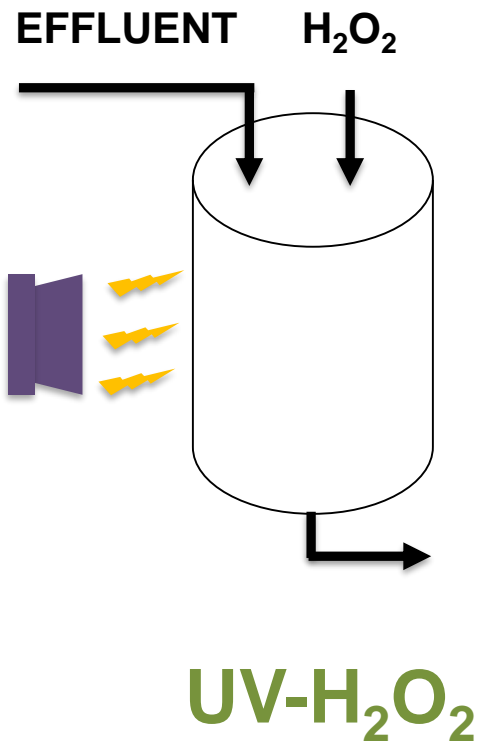
EMERGING CONTAMINANTS: THE CYCLE



EMERGING CONTAMINANTS: REMEDY BY ADVANCED OXIDATION PROCESSES (AOP)

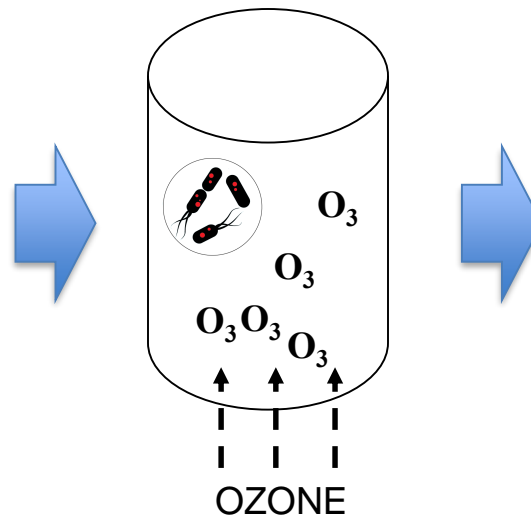


ADVANCED OXIDATION PROCESSES

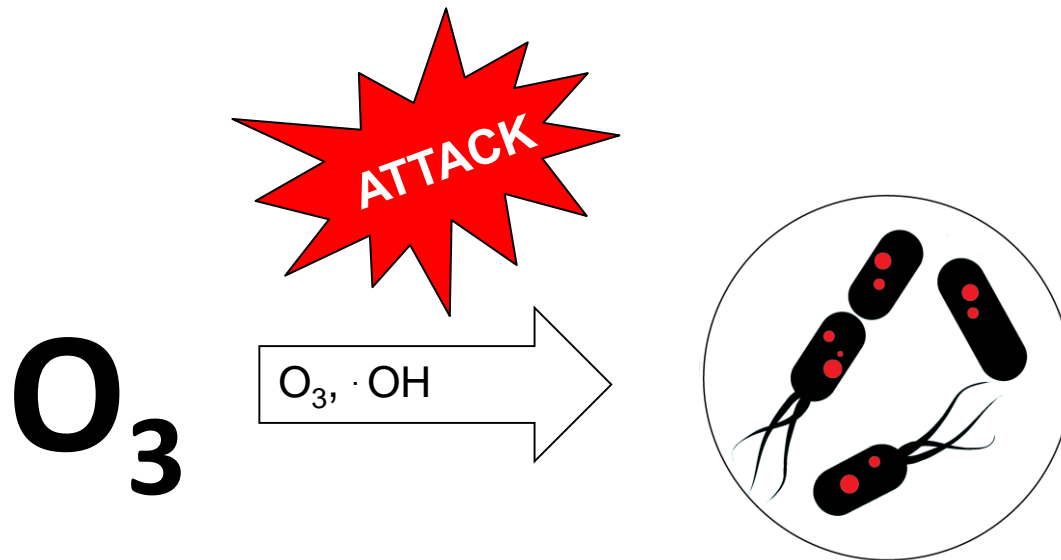


OZONATION

A WIDELY USED METHOD FOR DISINFECTING WATER

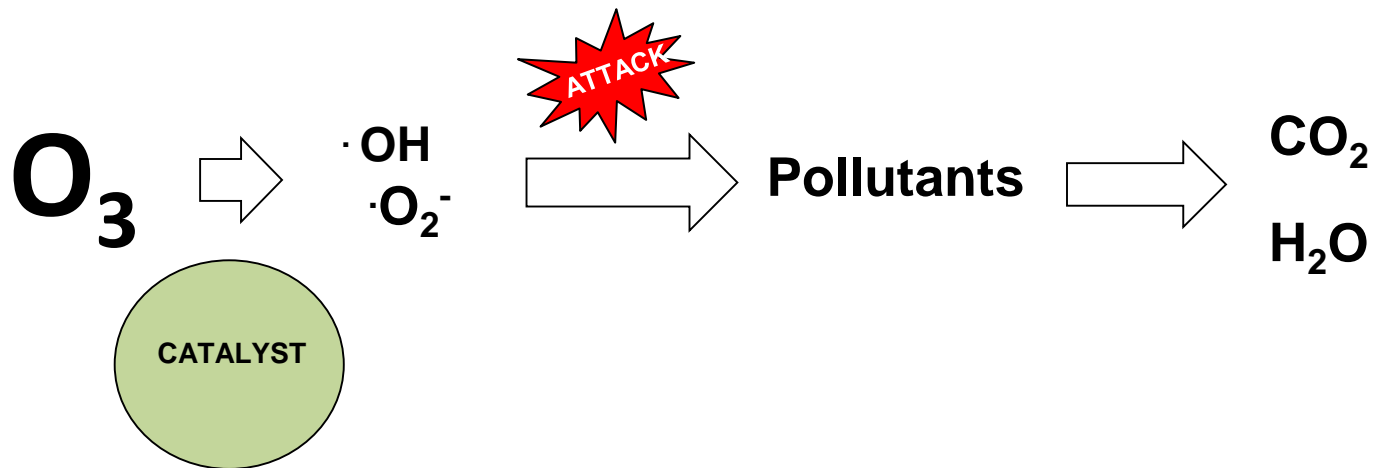


OZONATION



- GOOD AT REMOVING MICROBES
- WEAK IN REMOVING EMERGING CONTAMINANTS

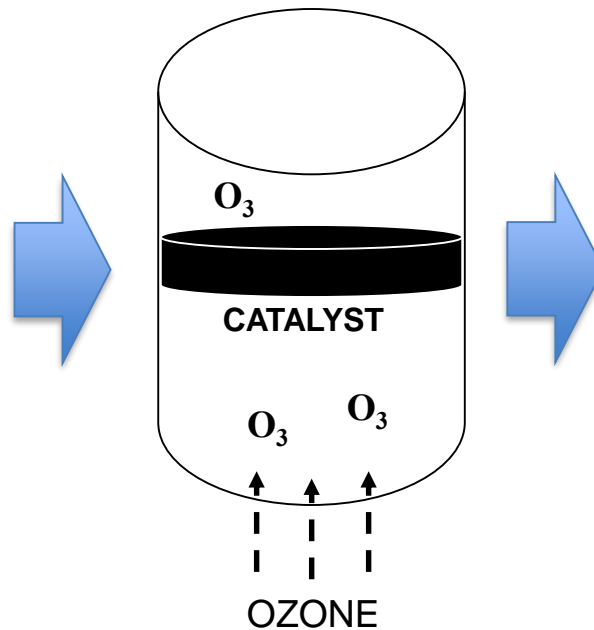
CATALYTIC OZONATION (CATOZ)



WHY CATOZ

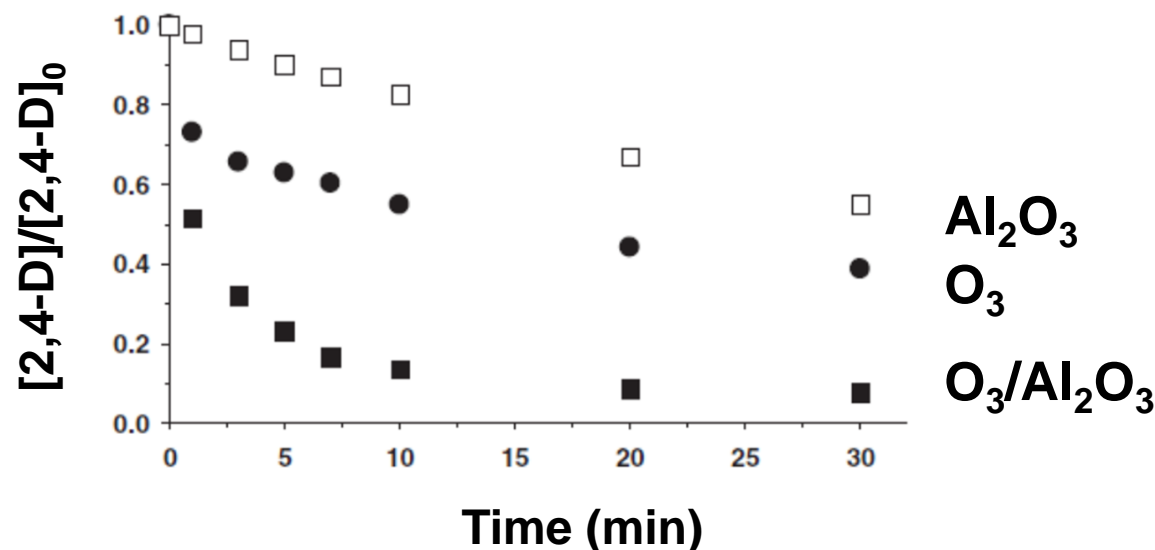
- LOW COST DUE TO LOW OZONE REQUIREMENT
- NON-SELECTIVE
- MINERALIZES POLLUTANTS

CATALYTIC OZONATION



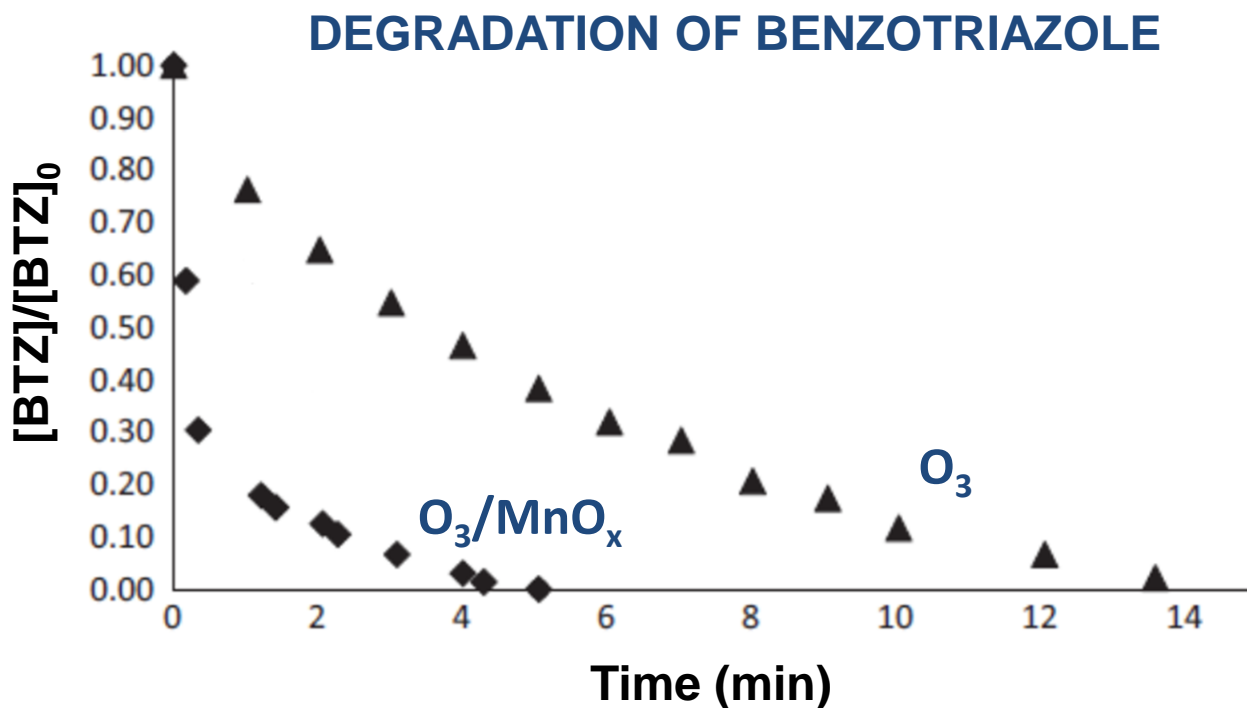
OZONATION & CATALYTIC OZONATION

DEGRADATION OF 2,4-D



**HIGHER DEGRADATION OF 2,4-D BY CATOZ
THAN SINGLE OZONATION**

OZONATION & CATALYTIC OZONATION



**HIGHER DEGRADATION OF BENZOTRIAZOLE BY CATOZ
THAN SINGLE OZONATION**

PROMISES & CHALLENGES

LOW OZONE REQUIREMENT

NON-SELECTIVE

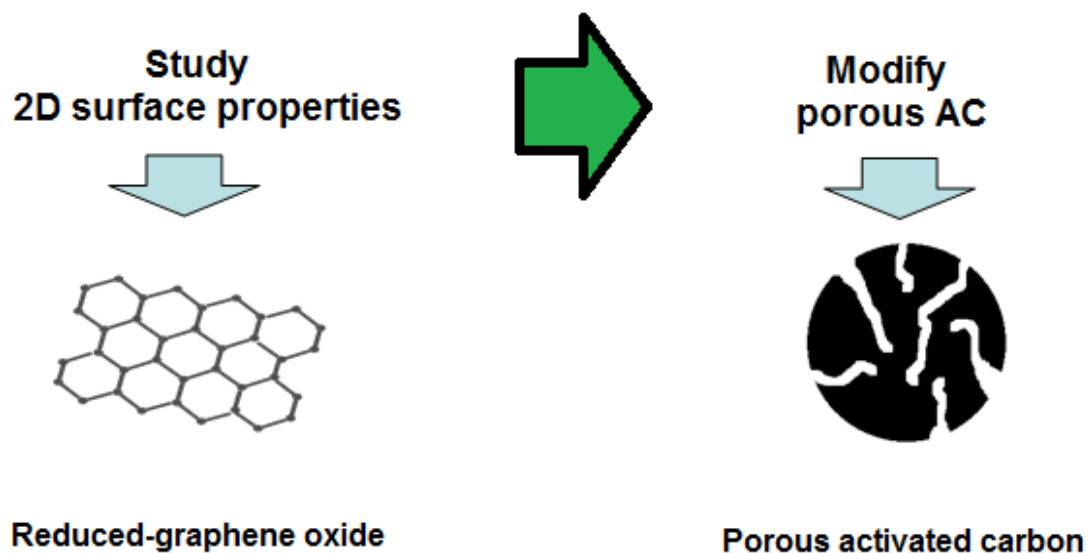
REMOVE EMERGING POLLUTANTS

MORE RESEARCH NEEDED FOR COMMERCIALIZATION

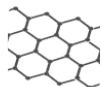
MESSAGE TO TAKE HOME

CATOZ is a promising technology to solve emerging pollutant problem

CURRENT RESEARCH



WHAT TO GAIN?



NEW NON-METAL CATALYSTS



MORE EFFECTIVE AC CATALYSTS

Acknowledgements



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FOR FURTHER READING

Urban wastewater treatment plants as hotspots for antibiotic resistant bacteria and genes spread into the environment: a review, *Science of the total environment*. <https://doi.org/10.1016/j.scitotenv.2013.01.032>

Emerging threats and persistent conservation challenges for freshwater biodiversity, *Biological Reviews*. <https://doi.org/10.1111/brv.12480>

Catalytic ozonation for the treatment of synthetic and industrial effluents-Application of mesoporous materials: A review, *Journal of environmental management*. <https://doi.org/10.1016/j.jenvman.2018.01.052>

