

Large scale air decontamination system using dielectric barrier discharge combined with UV-activated TiO_2



[RECOVERY
AND RESILIENCE]
PLAN

INTRODUCTION

AIR QUALITY

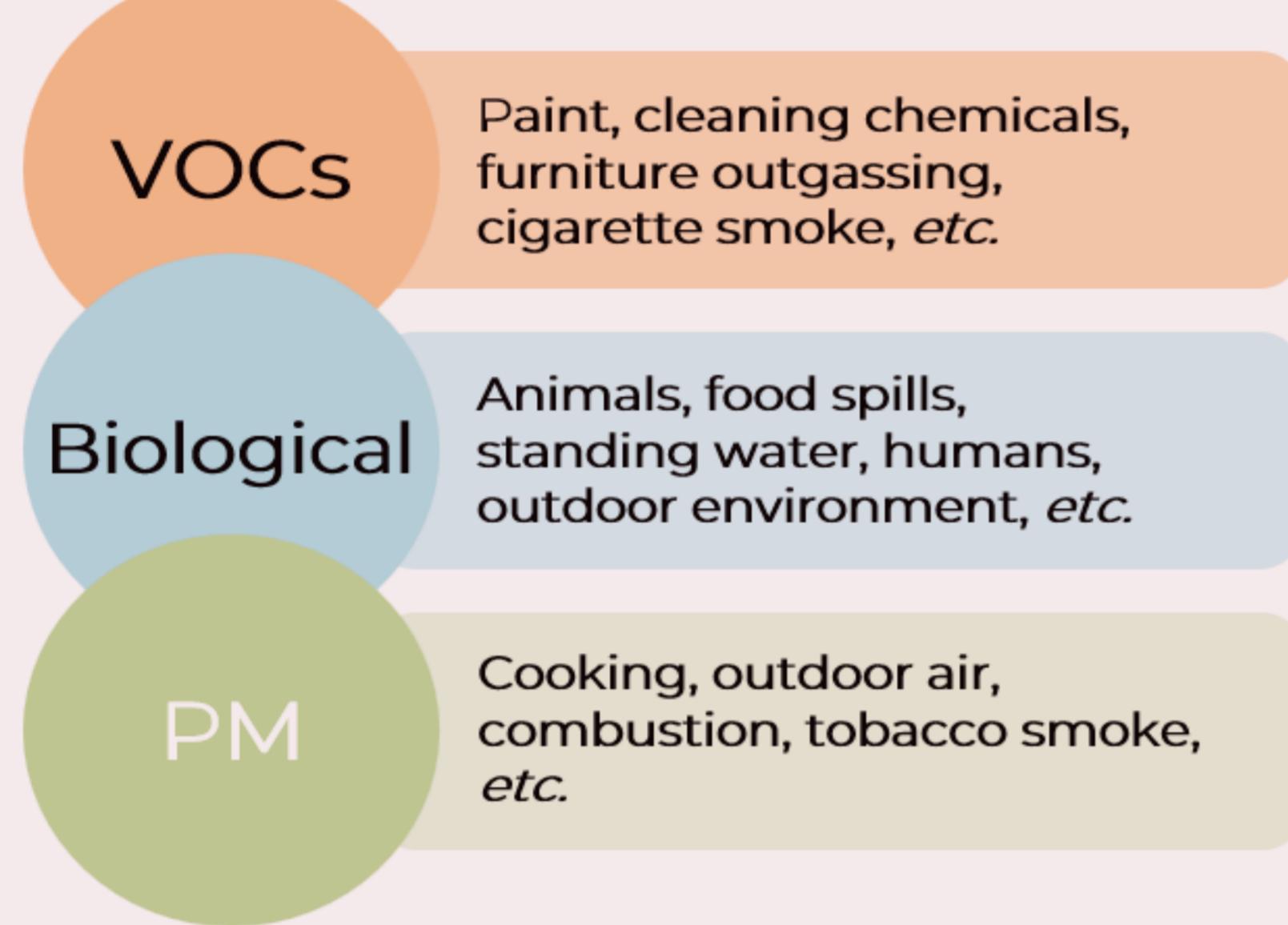
1 out of 10 deaths related to pollution diseases  90% of the time spent indoors in Europe

5.5 million people die prematurely due to indoor air pollution (2013) 49% of the cities do not meet WHO pollution guidelines

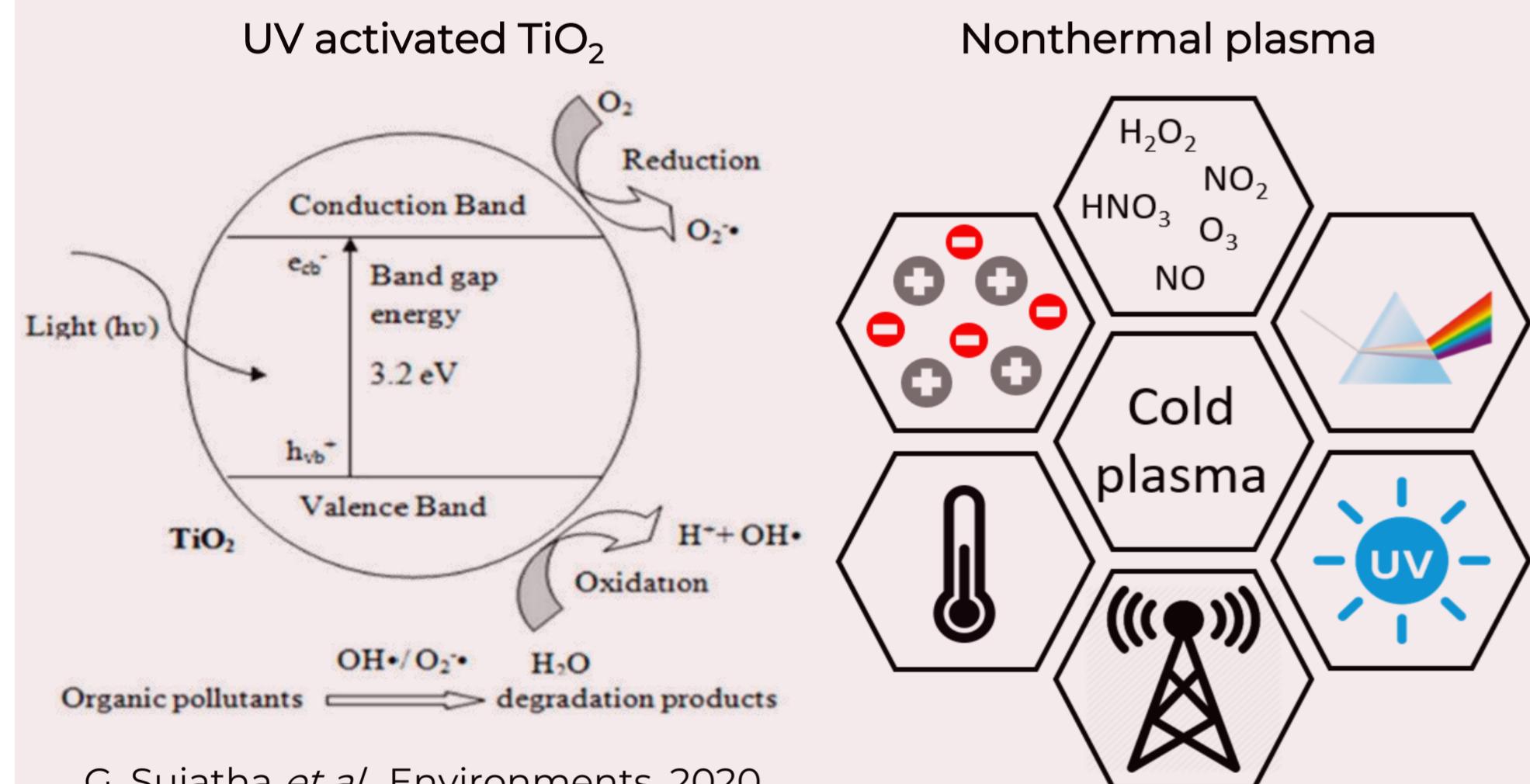
1.43\$ trillion - Costs associated to air pollution in Europe (2010) 42.9\$ billion - Corresponded to Spain

15% reduction of employee's productivity by low indoor air quality

J. G. Martín *et al.*, Chemosphere, 2020

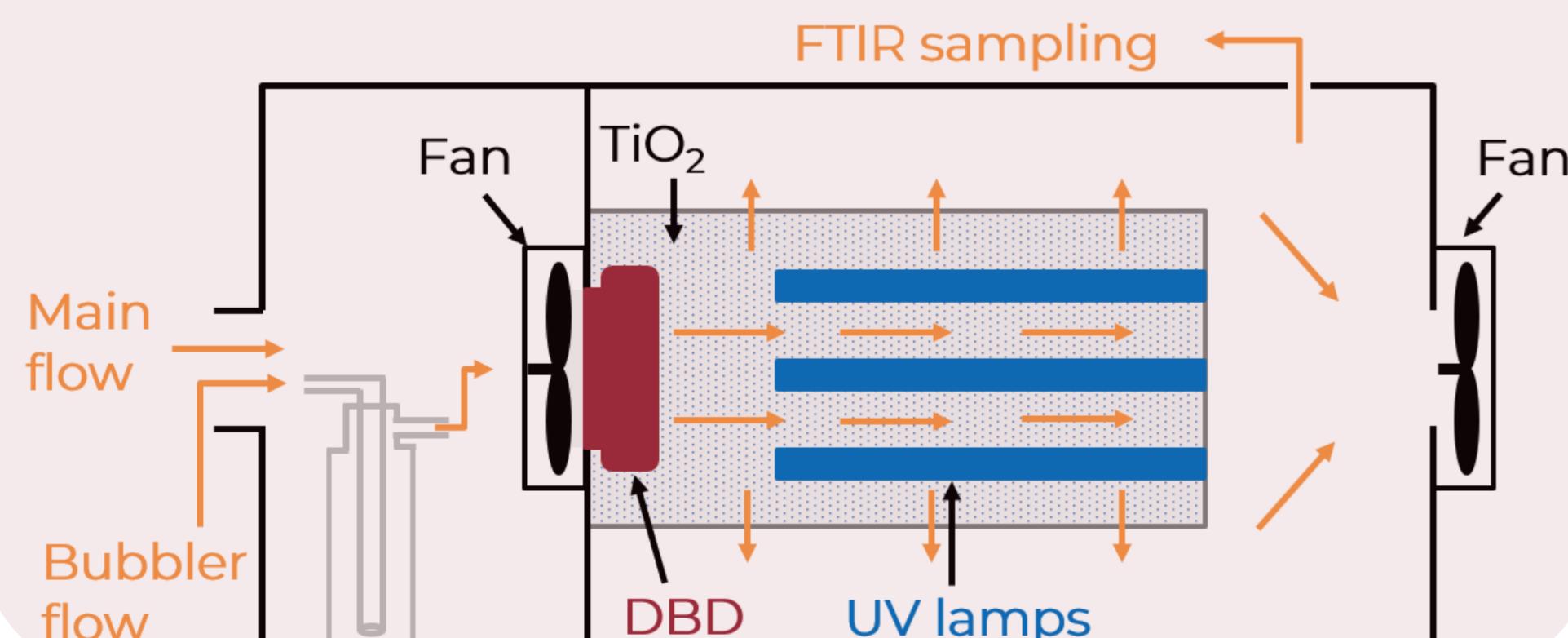


How to deal with those pollutants ?



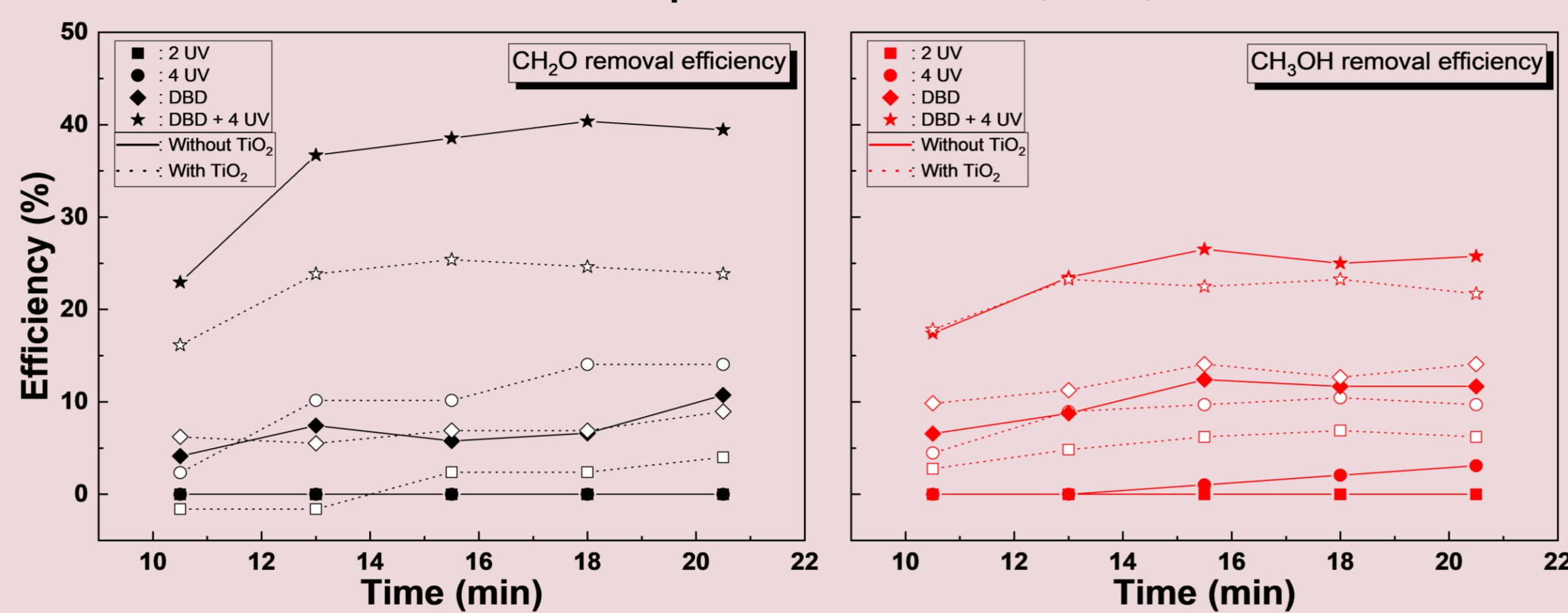
G. Sujatha *et al.*, Environments, 2020

EXPERIMENTAL SETUP



RESULTS

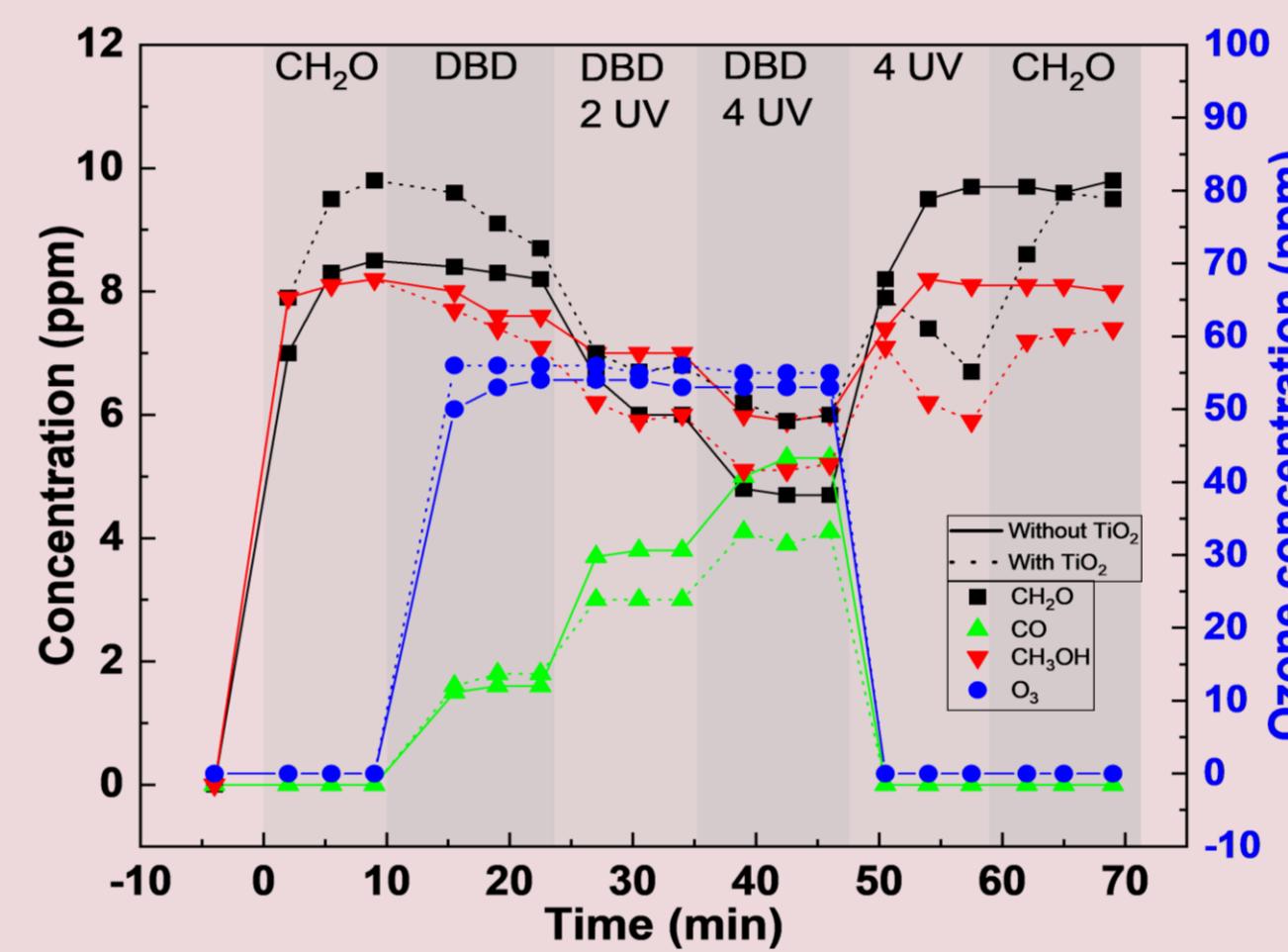
Effect of the components: DBD, UV, DBD + UV



Better efficiency without TiO_2 . Low effect of the single elements alone.

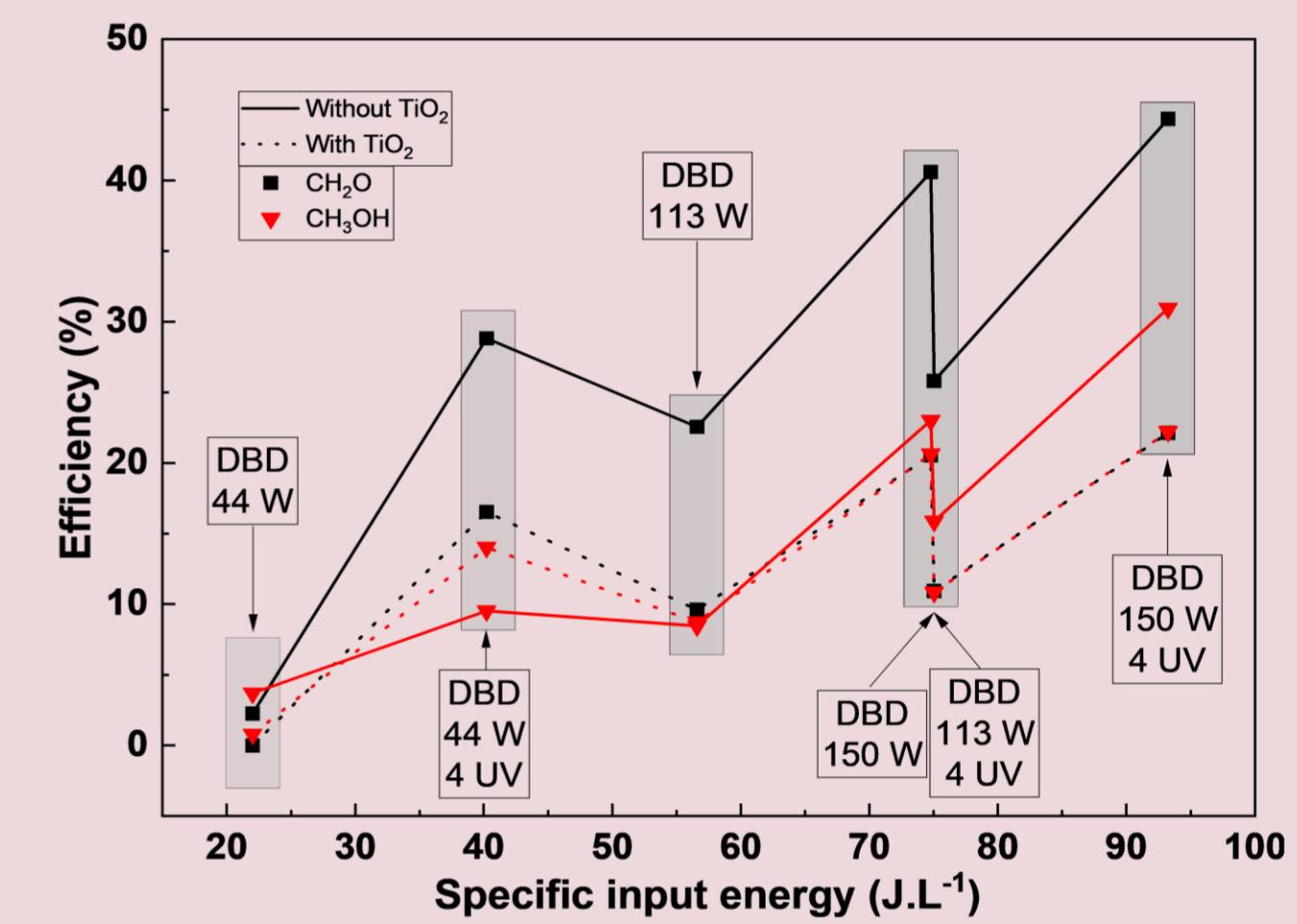
Byproducts formation

Relative humidity 60%, 120 L/min, 115 W

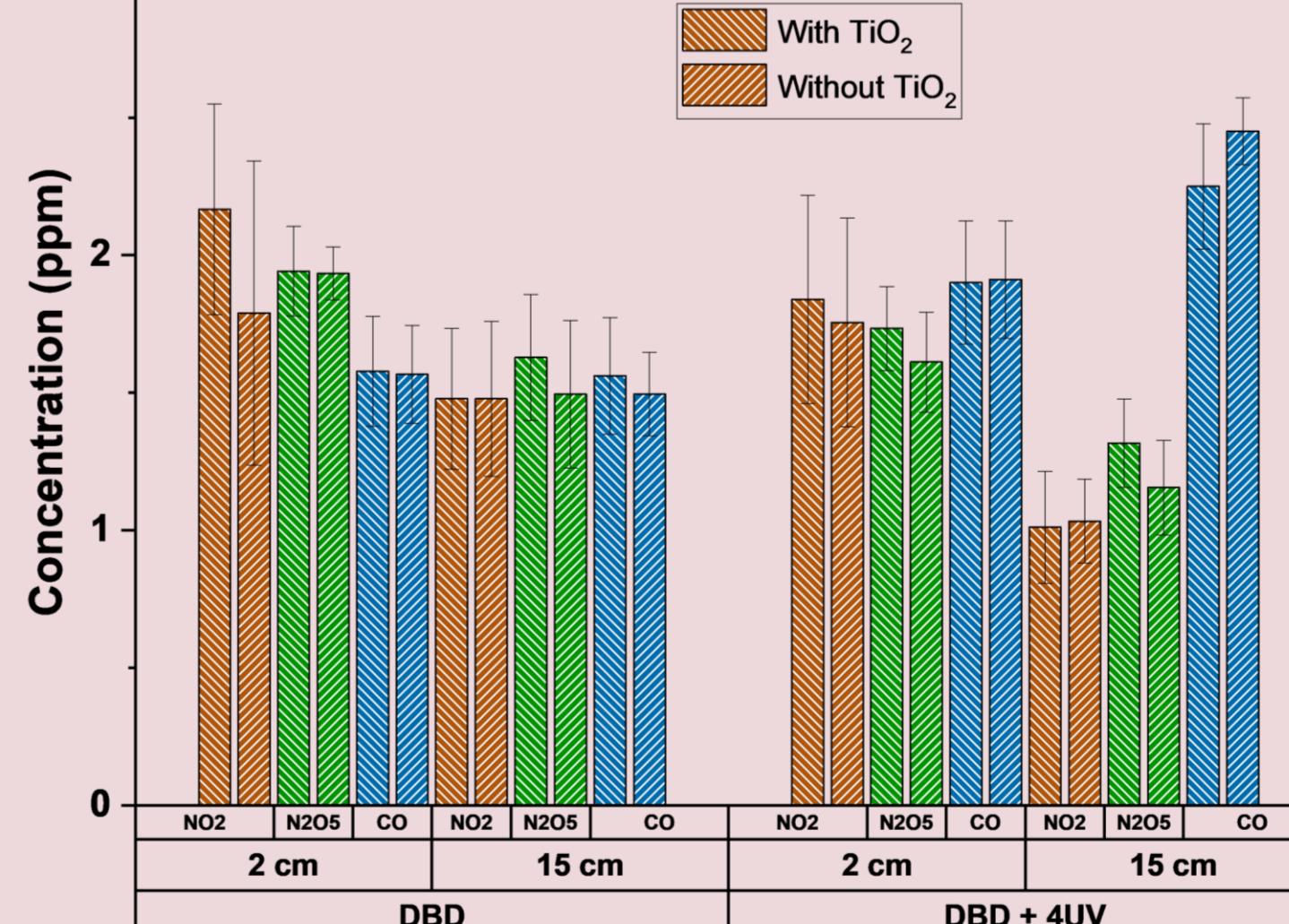


The main formed byproduct are CO , CO_2 , and O_3 . For the same specific input energy, the synergy between plasma and UV is more interesting in terms of efficiency.

Impact of the specific input energy

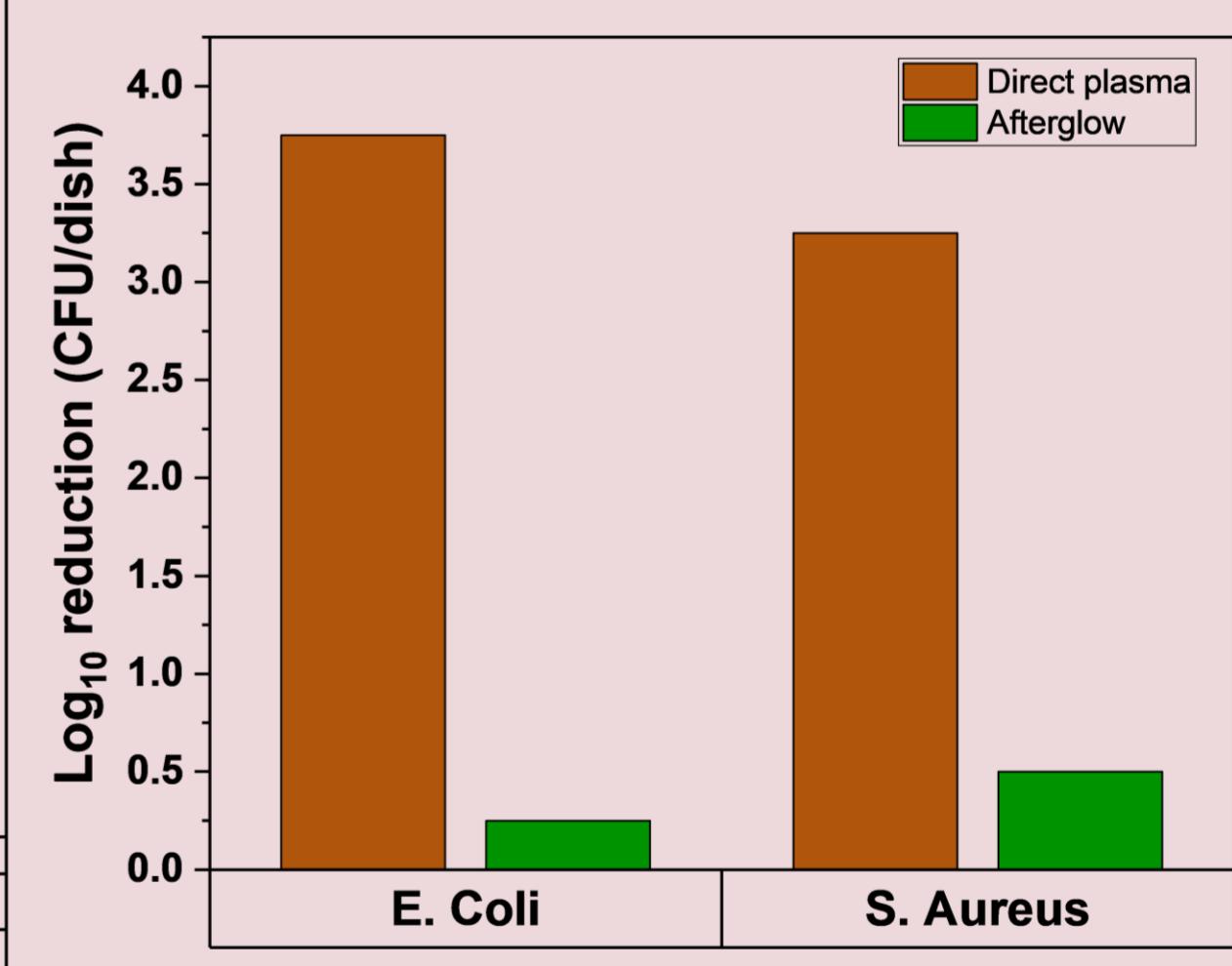


Influence of FTIR sampling distance



Change of chemistry depending on the distance → Several steps fragmentation ?

Preliminary results on bio-decontamination



Complete inactivation of bacteria with single pass in the discharge

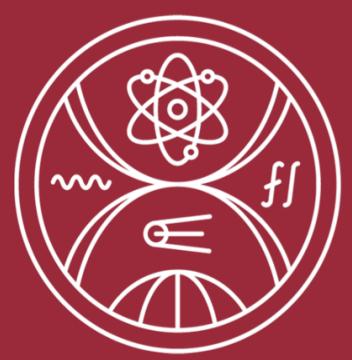
T. Vazquez *et al.*, J. Elstat. 2025

CONCLUSION

Promising results for indoor air cleaning using a combination of plasma and UV lamps
Efficiency up to 50% at removing formaldehyde in a single pass
The synergy of the discharge and UV lamps gives the best results
The fragmentation processes seem to vary at different distances from the plasma
Complete inactivation of *E. Coli* and *S. Aureus* using the plasma only

Alex Destrieux, Thomas Vazquez, Aleksandra Lavrikova and Zdenko Machala

Department of Astronomy, Physics of the Earth, and Meteorology
Division of Environmental Physics
Faculty of Mathematics, Physics and Informatics



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