A straightforward approach to fabricate photocatalytic materials using composite nanocellulose aerogels: application in atmospheric environmental remediation

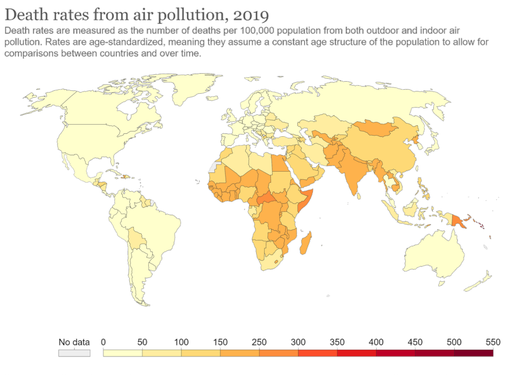
Eduardo Espinosa[1], Sergio Carrasco[1], Zoilo González[1], Manuel Cruz-Yusta[2], Luis Sánchez[2], Alejandro Rodríguez[1]

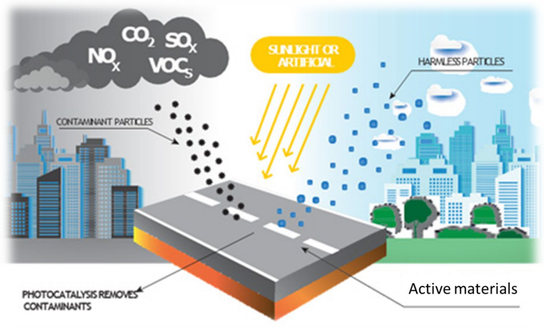
[1] *1BioPrEn Group (RNM 940), Chemical Engineering Department, Instituto Químico para la Energía y el Medioambiente (IQUEMA), Universidad de Córdoba, Córdoba 14014, Spain*

[2] *Departamento de Química Inorgánica, Instituto Químico para la Energía y el Medioambiente (IQUEMA), Universidad de Córdoba, Córdoba 14014, Spain*

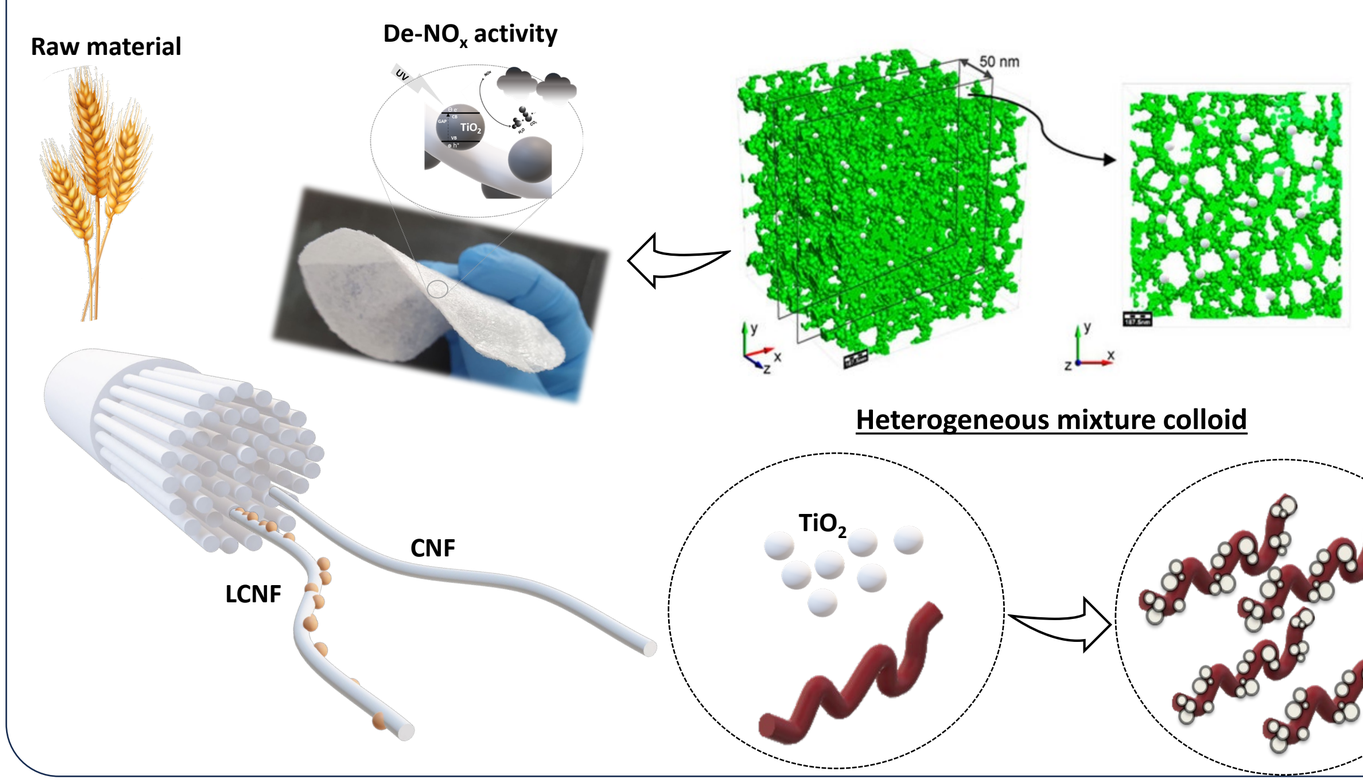
Introduction

Air pollution is **one of the world's leading risk factors for death**, attributed to millions of deaths each year. Air pollution is attributed to **11.65%** of deaths globally. Death rates from air pollution are **highest in low-to-middle income countries, with more than 100-fold differences** in rates across the world**. Aerogels**, with their extraordinary properties of **high surface area and low density**, are catalyzing a transformation in urban environments by driving the advancement of **photocatalytic islands** within cities. These remarkable materials are being harnessed to combat **air pollution**, enable self-cleaning surfaces, purify urban wastewater, and enhance energy efficiency. Whether integrated into building facades, road pavements, or green urban spaces, aerogels are proving to be **versatile catalyst supports** that leverage sunlight's power to mitigate pollution, reduce maintenance costs, and contribute to cleaner, more sustainable urban living, ultimately fostering a greener and healthier urban future.



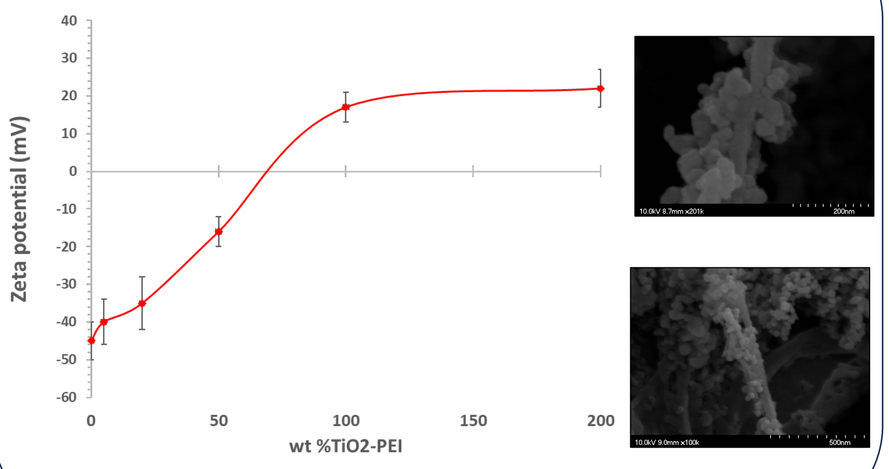


Materials and Methods

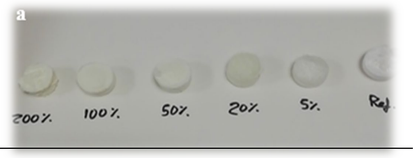


Results

Heterocoagulation

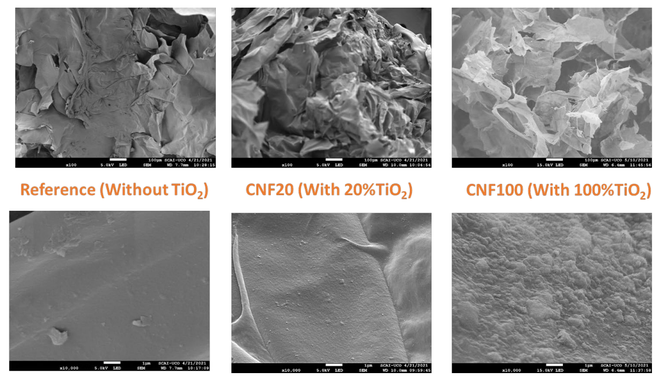


Physical properties

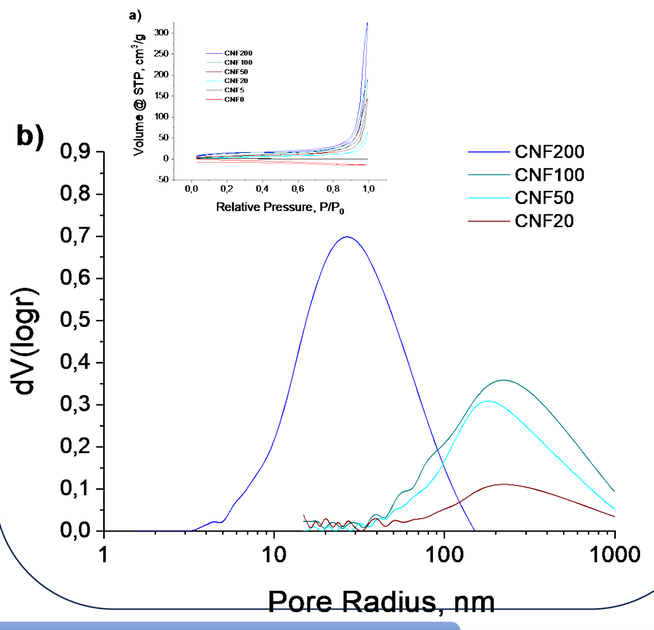


Sample	Volume Shrinkage (%)	Average Density ($cm^3 \cdot g^{-1}$)	Bulk Porosity (%)
CNF0	10.13 ± 0.72	4.59 ± 0.29	99.69 ± 0.02
CNF5	12.58 ± 2.44	4.73 ± 0.51	99.68 ± 0.03
CNF20	14.19 ± 0.36	5.69 ± 0.10	99.67 ± 0.01
CNF50	16.02 ± 2.19	7.27 ± 0.41	99.64 ± 0.01
CNF100	16.44 ± 1.16	9.78 ± 0.37	99.66 ± 0.01
CNF200	18.38 ± 0.72	15.40 ± 0.18	99.53 ± 0.01

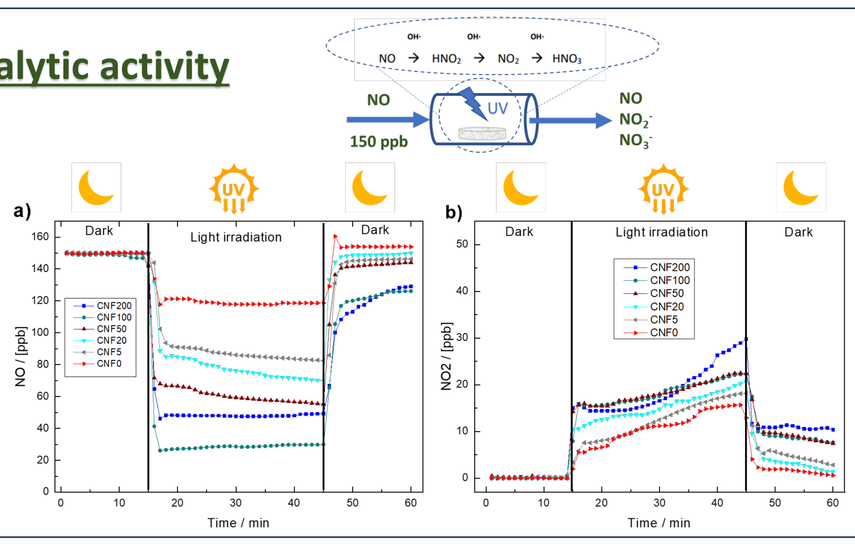
Hybrid-aerogels 3D structure

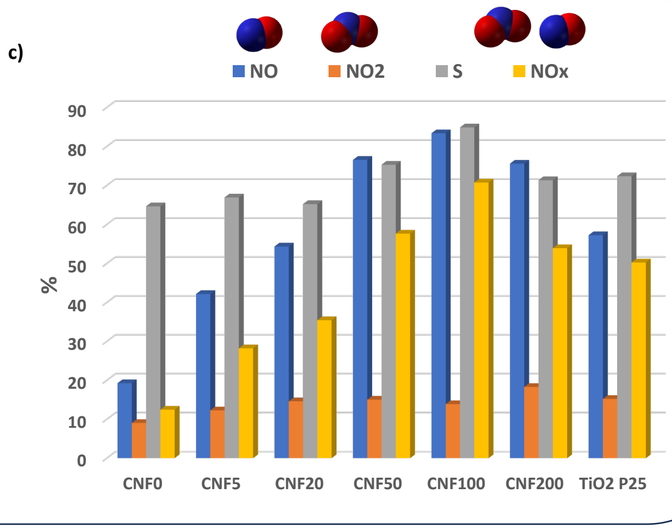


Specific surface area and pore size



Photocatalytic activity





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