UTAustin Portugal

Passive sampling for air quality assessment: proposal of an in-situ method to measure the efficiency of photocatalytic pavements

Nanotechnologies

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Abstract

Air pollution is a matter of great relevance due to its significant impact on the human health and the environment. Photocatalysis using titanium dioxide (TiO_2) nanoparticles, known for high the efficiency and low environmental degradation, is considered a highly promising means to improve air quality. Thus, this study aims to elucidate how assess the nitrogen dioxide (NO_2) in the atmosphere through passive sampling and, which will subsequently be used to measure the efficiency of photocatalytic pavements in situ. This method has the potential to provide insights into the practical implications of photocatalytic pavements in reducing NO_2 emissions, contributing to a better understanding of their real-world impact on air quality.

Methodology

This approach is based on the modified Griess-Saltzman method, involving three steps:
1) Passive samplers are prepared with cellulose filters impregnated with a KI and KOH solution in methanol and placed inside Teflon cylinders.
2) Samplers are deployed in the field for specific periods (24 h to 21 days) based on environmental conditions like temperature, humidity, air speed and pollutant concentration.
3) Filters are removed after sampling and immersed in a desorption solution containing NEDA, which turns pink upon contact with nitrogen oxides. The solution is analyzed using UV/VIS spectrophotometry, and the amount of NO_2 is calculated by Fick's law of diffusion.
This method assesses NO_2 levels in the atmosphere and could be used to evaluate the efficiency of photocatalytic pavements.
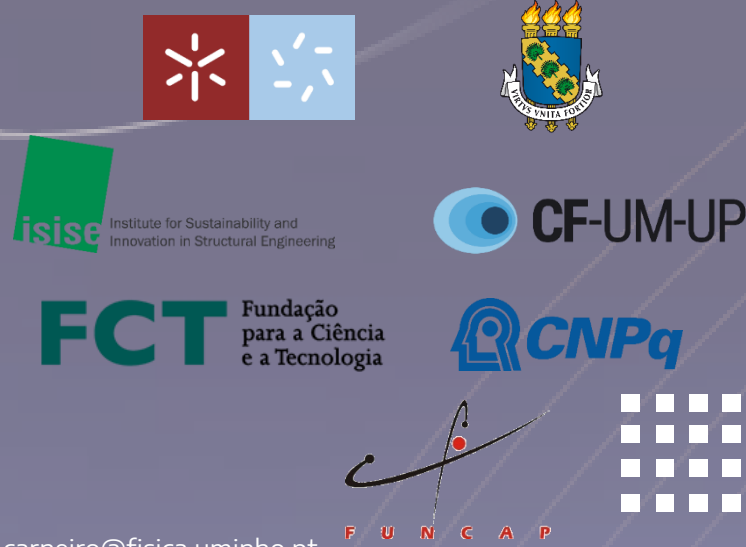
Discussion

Passive sampling is a simple and low-cost method to measure atmospheric pollutants. It does not require any electrical connections, making it more versatile and applicable in various situations and locations. It could be used to analyse photocatalytic pavements but requires calibration.
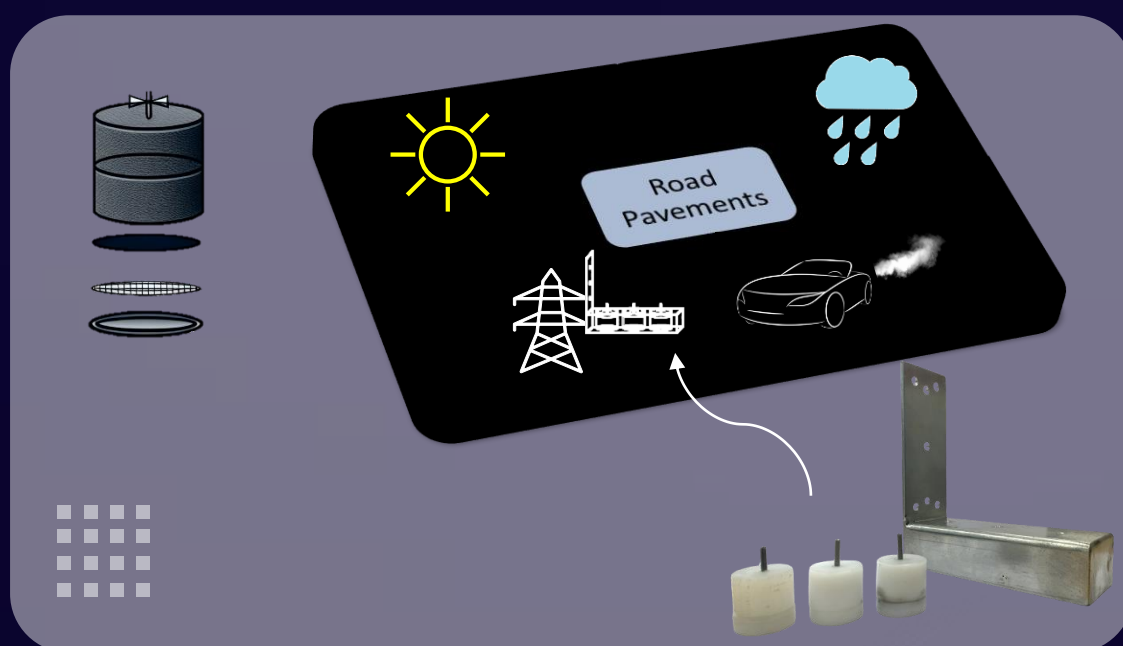
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