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PORTABLE PHOTOREACTOR FOR A FAST ON-SITE MEASUREMENT OF THE PHOTOCATALYTIC ACTIVITY OF A MATERIAL

F. Pellegrino¹, V. Maurino¹, M. Zangirolami², C. Minero¹

¹*Dipartimento di Chimica, Università degli Studi di Torino, Torino, Italy*

²*Fonderia Mestieri Srl, Alpignano (TO), Italy*

The possible market for photocatalytic materials, in the form of powders, built-in powders, thin films and nano-structured materials, as well as devices directed to specific applications, is estimated in exponential growth. However, the central problem is the standardization of the procedures for photocatalytic efficiency evaluation of an illuminated catalyst. For gas/solid experiments different reactors, like batch or flow-through either continuous stirred-tank reactor (CSTR) or plug flow reactor (PFR), were proposed [1,2], in order to measure the rate of conversion of a standard substrate under controlled conditions. Experiments show that a CSTR configuration² presents a lot of advantages for practical use, as any volume, any shape of catalyst and any flow of gas into the reactor can possibly be used [3]. In the framework of the SETNanoMetro EU project we developed and patented a portable CSTR photoreactor with controlled illumination and purposely designed fluidodynamics in order to obtain a photocatalytic rate evaluation independent on the measurement conditions, characteristic only of the catalyst [4]. The reactor allows fast (few minutes) and on site measurements with a choice of different substrates. This is a step in the direction to obtain a traceable measurement of photocatalytic activity and properly compare different catalysts.

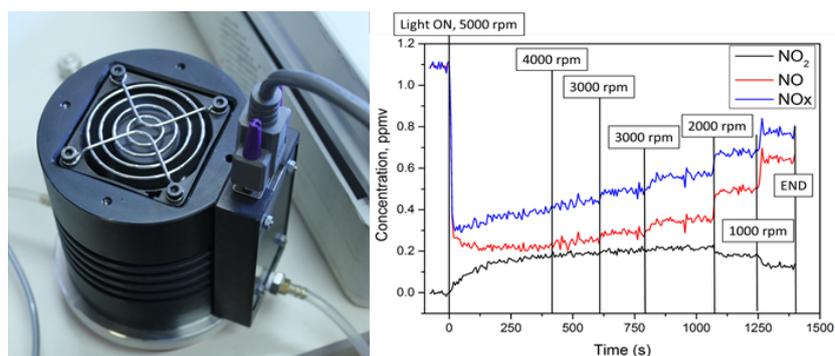


Figure 1. Portable photoreactor developed for photocatalytic activity evaluation and example of a test using NO as substrate

References

[1] UNI NORM 11484/2013

[2] ISO NORM 22197/2017

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[3] C. Minero, A. Bedini, and M. Minella, *International Journal of Chemical Reactor Engineering* 2013; 11(2): 717–732

[4] Maurino V., Minero C., Pellegrino F., Zangirolami M. – European Patent: “System for Lighting and measuring the Photo-Catalytic Activity of the Reactive Surface of a Material” - Application Number: 17000861.9-1554” - 19/05/2017