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VOC emission profile generated by multifunctional composite materials designed for the recovery of agro-industrial and sheep's wool waste

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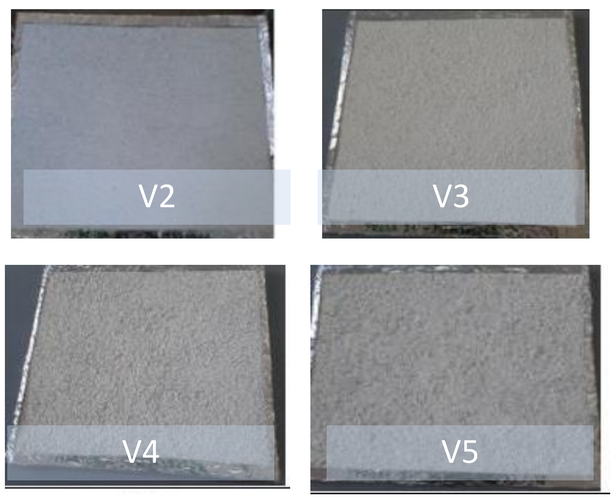
Sustainable waste management is a challenge worldwide, considering the fact that the problem of waste is currently one with complex implications, and the failure to achieve an adequate management of waste, affects both the health of the population and the environment quality. One of the current concepts, with high priority on the Europe Agenda is the concept of circular economy regarding the improvement of waste management. On the other hand, the indoor environment is equally important, and when we talk about new finishing materials, the effect generated by indoor emissions, must be minimal. In this context, our research is focused on recovery of agro-industrial and sheep's wool waste in two types of aqueous dispersion finishing/protection products (as binder). We aimed to obtain new, innovative multifunctional materials with technical characteristics equal to or superior to existing products.

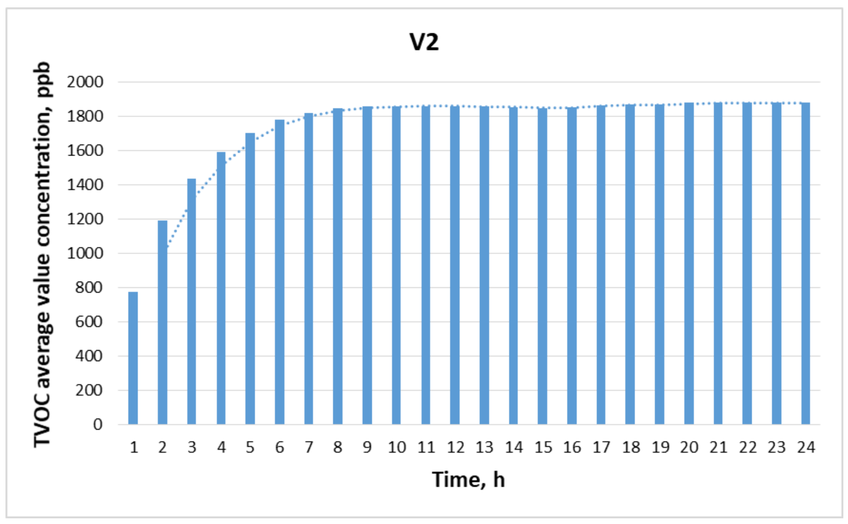
The present paper shows the results from the monitoring of VOCs emissions of four types (V2, V3, V4 and V5) of multifunctional materials (finishes/protections) with embedded agricultural waste, in the closed mode of the experimental stand S2. It should be noted that each of the above-mentioned finishes is a distinct composite material, with its own recipe and content of agricultural waste. The measurement of VOC emissions, in ppb, was performed using a direct detection method and the portable data-logging detector IQ-610 probe (Gray Wolf Sensing Solutions, USA), in the range 20 – 20000ppb, with a resolution of 1ppb. The operating principle is based on electronic detection, having a photo-ionization detector (PID). The equipment was calibrated before the measurements. The sampling interval for the VOC concentrations was one minute and the total recording period was 24 hours.

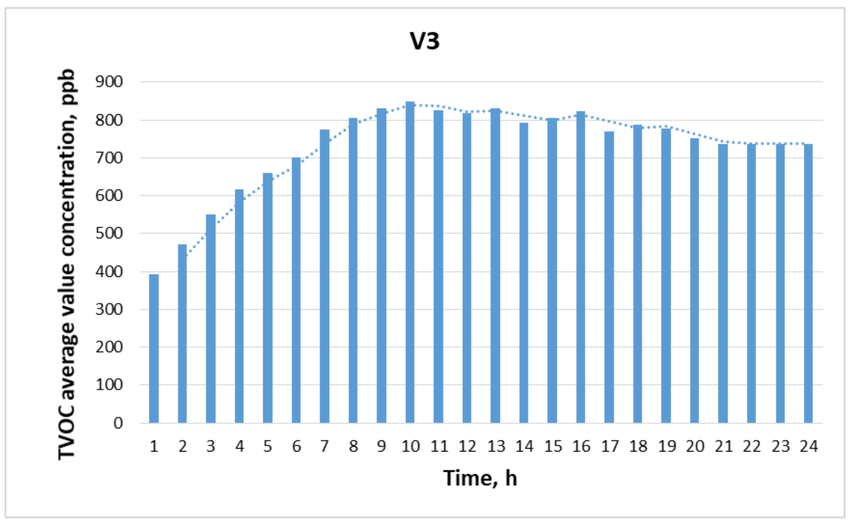
INCERC Experimental Stand
(Emission Test Chamber – ETC)

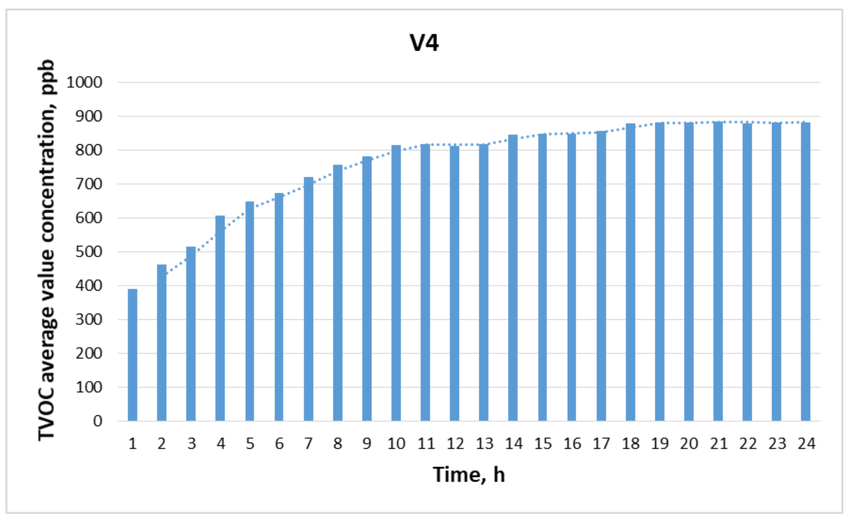


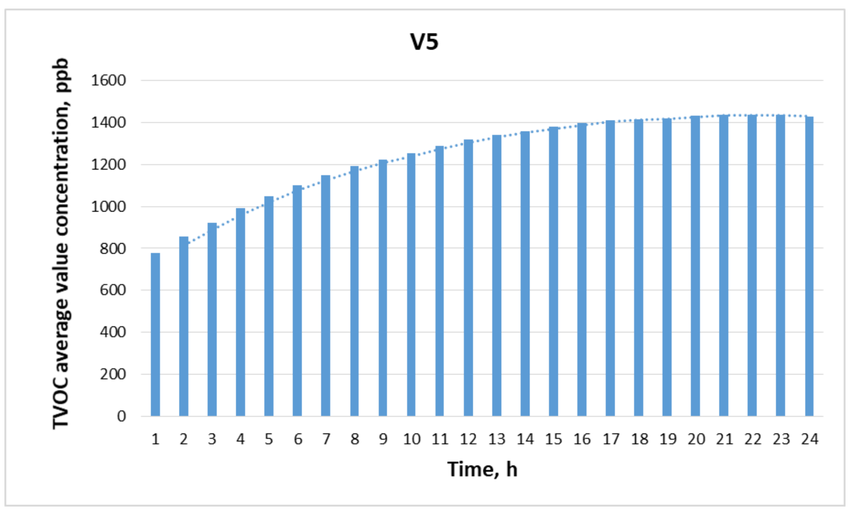
Multifunctional materials with embedded agricultural waste

The VOC emission profile generated by composite materials is similar for all four products, with an ascendent curve till a maximum value, followed by a plateau zone, specific for each monitored material. The highest monitored values were for V2 material (1687 ppb) and for V5 material (1236ppb) as a result of the multiple interactions between the composition of the binder, the characteristics of the additives (nature, size, quantity) of the applied multifunctional composite materials and implicitly the structure of the multilayer systems generated by the embedded agro-industrial and sheep's wool waste.









Considering the importance of a healthy indoor environment in which to spend our lives daily, when designing finishing products it is necessary to evaluate them also from the point of view of pollutant emissions to ensure a lowest impact on the occupants health.

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