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Sustainable porous material derived from industrial by-product for airborne particulate matter entrapment

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Abstract

Large-scale waste generation and high concentrations of pollutants in cities, especially particulate matter (PM), are leading to important environmental challenges. New sustainable approaches, such as "Azure Chemistry", need to be investigated. This approach aims to restore or reconstruct the ecosystems by sustainable solutions in terms of energy, materials and emissions. The aim of this work is to present a sustainable porous material, SUNSPACE ("SUstaiNable materials Synthesized from by-Products and Alginates for Clean air and better Environments"), for airborne PM entrapment. SUNSPACE is realized by using industrial by-products, like silica fume and bottom ash, low-cost materials and low temperature thermal process. SUNSPACE is inspired by the ability of leaves to trap the PM and be regenerated by rainfall. SUNSPACE characterization shows the clear presence of pores, from micron to nanometer sizes, ideal to trap ultrafine PM, the most dangerous for human health. Different tests were conducted to evaluate the ability of SUNSPACE to capture PM in not controlled (such as particles generated by diesel, incense and cigarettes smokes and generated at industry of steel alloy) and controlled conditions (using an aerosol nanoparticles generator). In addition the nanoparticle entrapment capacity of SUNSPACE was compared with the adsorption capacity of cement and leaves. Results are encouraging to continue the development of this material. The idea is to use SUNSPACE as a coating, on all the urban surfaces (such as wall, tiles, roof or street borders) leading to an improvement of urban air quality.

Biography:

Antonella is a second year PhD student at the University of Brescia, Italy. Her research activity concerns the improvement of sustainable porous materials following the principles of the "Azure Chemistry". Antonella got a bachelor and master degree in Environmental Engineering at the University of Naples "Federico II" with a research thesis concerning the evaluation of air quality at urban scale, carried out in collaboration with ENEA (Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile) and University of Lyon, France.

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