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Magnetic analyses of powders from exhausted cabin air filters

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The automotive cabin air filter is a pleated-paper filter placed in the outside-air intake for the car's passenger compartment. Dirty and saturated cabin air filters significantly reduce the airflow from the outside and introduce particulate matter (PM) and allergens (for example, pollen) into the cabin air stream.
Magnetic measurements and analyses have been carried out on powders extracted from exhausted cabin air filters to characterize their magnetic properties and to compare them to those already reported for powders collected from disk brakes, gasoline exhaust pipes and Quercus ilex leaves.
This study is also aimed at the identification and quantification of the contribution of the ultrafine fraction, superparamagnetic (SP) at room temperature, to the overall magnetic properties of these powders. This contribution was estimated by interpreting and comparing data from FORCs, isothermal remanent magnetization vs time decay curves, frequency and field dependence of the magnetic susceptibility and out-of-phase susceptibility.
The magnetic properties and the distribution of the SP particles are generally homogenous and independent of the brand of the car, of the model of the filter and of its level of usage.
The relatively high concentration of magnetic PM trapped in these filters poses relevant questions about the air quality inside a car.