

# Retention of particulate matter by the use of high efficient cabin air filter elements

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## Background

The potential dangers of particulate matter to the human health are in discussion recently. Due to the high concentrations of dust particles on traffic routes, highways and downtown roads it is very important to prevent the passengers of cars, trucks and buses from the exposure to particulate matter. Therefore further development of cabin air filters with the objective of high filtration efficiencies is necessary.

Recently great efforts are being made to improve the filter performance of both particle filters as well as combined filters, which provide simultaneous particle filtration and adsorption of harmful gases. A promising method of increasing the separation efficiencies of filter media is the use of very fine fibers with diameters of less than 1  $\mu\text{m}$ , so called nano fibers. Using a filter medium containing a small amount of nano fibres it is possible to increase the initial separation efficiency for KCl aerosol at the most penetrating particle size (MMPS) up to 75 %. An intelligent composition of the filter media with gradient structure helps to fulfil the further requirements of cabin air filter elements according the dust holding capacity (life time) and the differential pressure. The performance of newly developed filter media will be exemplified by the comparison of filtration efficiencies using salt aerosols and ISO test dusts, dust capacities and differential pressure of both particle and combined filter elements.

Furthermore the use of fine fibres for the particle filtration layer of cabin air filters is essential to overcome a major drawback of the common electret media: The significant drop of the filtration efficiency after a short time of usage. Due to humidity, heat and dust loaded onto the fibres the electrostatic filtration mechanism does not work as in new condition. Filter media with fine fibres work as mechanical filters, so the filtration efficiencies even get better during usage. The differences between electret filter media and mechanical filter media will be shown by initial and fractional filtration efficiencies of particle and combined cabin air filters.