Abstract Submitted
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A novel concept of dielectrophoretic engine oil filter[1] BORIS KHUSID, YUEYANG SHEN, EZINWA ELELE , New Jersey Institute of Technology — A novel concept of an alternating current (AC) dielectrophoretic filter with a three-dimensional electrode array is presented. A filter is constructed by winding into layers around the core tube two sheets of woven metal wire-mesh with several sheets of woven insulating wire-mesh sandwiched in between. Contrary to conventional dielectrophoretic devices, the proposed design of electrodes generates a high-gradient field over a large working volume by applying several hundred volts at a standard frequency of 60 Hz. The operating principle of filtration is based on our recently developed method of AC dielectrophoretic gating for microfluidics. The filtration efficiency is expressed in terms of two non-dimensional parameters which describe the combined influence of the particle polarizability and size, the oil viscosity and flow rate, and the field gradient on the particle captivity. The proof-of-concept is tested by measuring the single-pass performance of two filters on positively polarized particles dispersed in engine oil: spherical glass beads, fused aluminum oxide powder, and silicon metal powder, all smaller than the mesh opening. The results obtained provide critical design guidelines for the development of a filter based on the retention capability of challenge particles.

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