

Supplementary Materials: Size Distribution, Elemental Composition and Morphology of Nanoparticles Separated from Respirable Coal Mine Dust Samples

Shoeleh Assemi ^{1,*†}, Lei Pan ², Xuming Wang ¹, Titilayo Akinseye ² and Jan D. Miller ¹

¹ Department of Materials Science and Engineering, College of Mines and Earth Sciences, University of Utah, Salt Lake City, UT 84112, USA; x.wang@utah.edu (X.W.), jan.miller@utah.edu (J.D.M.)

² Department of Chemical Engineering, Michigan Technological University, Houghton, MI 49931, USA; leipan@mtu.edu (L.P.), takinsey@mtu.edu (T.A.)

* Correspondence: sassemi@imessaresearch.com; Tel.: +1-3852425656

† Present address: Imessa Research, 630 Komas Dr, Suite 300, Salt Lake City, UT 84108, USA.

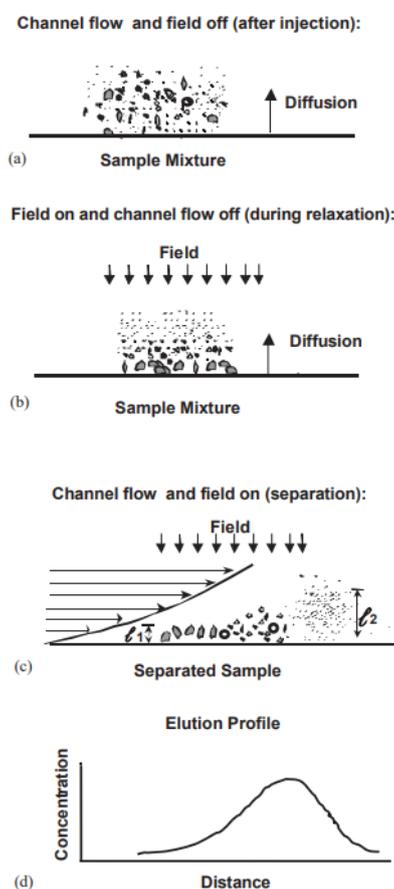


Figure S1. Schematic diagram of particle separation in an FFF channel. (a) sample is injected in a thin channel and in incoming field is applied perpendicular to the direction of the flow (b) the field is turned off for a set period (relaxation time), during which the sample species are pushed downwards as a result of the applied force but also move upwards as a result of their Brownian motion, until sample clouds with different sizes reach an equilibrium position relative to the channel height. (c) The channel flow is then turned on. The smaller samples with a higher diffusion coefficient will interact with faster stream of the laminar flow and will elute earlier, and particles with larger size will elute later (d) Figure from [26].

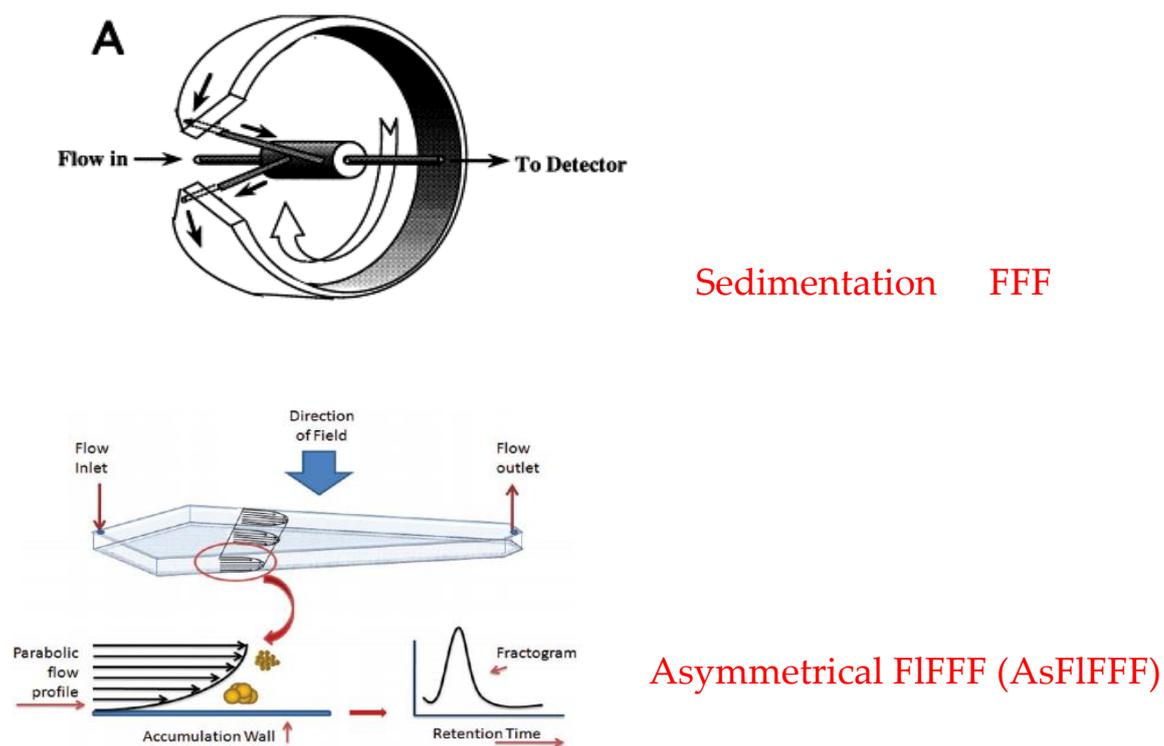


Figure S2. Channel designs in Sedimentation FFF (SdFFF) and Asymmetrical Flow FFF (AsFIFFF). In SdFFF, the channel spacer is fit inside a centrifuge basket. In AsFIFFF, the spacer is trapezoidal and is sandwiched between two frits. Figures are from [21] and [23].

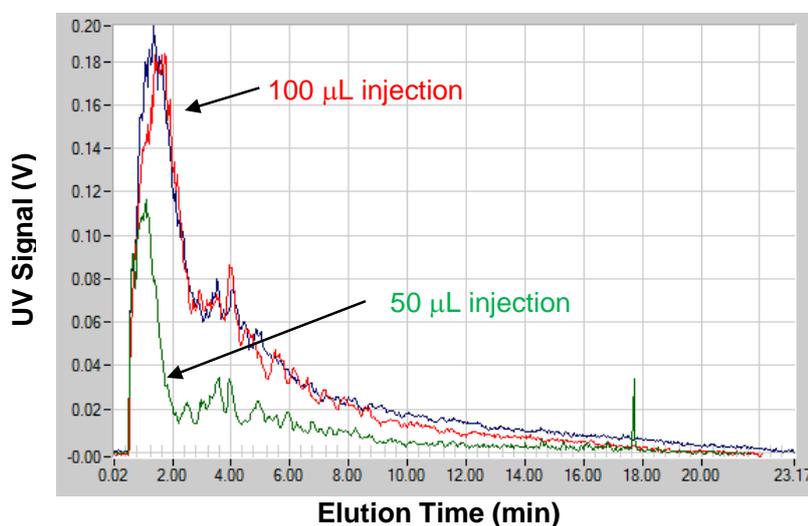


Figure S3. Elution profiles for sample 3 from the bolter site with two different injection volumes. Reducing the injection volume by half resulted in a two fold reduction in the area under the curve