

NANOPARTICLE AGGLOMERATES LOADING ON FIBROUS FILTER

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ABSTRACT

Most filtration studies have been conducted with spherical or similar shape particles due to the difficulty of evaluating the filtration behavior of irregular particles. However, real particles often have a complicated structure which influences their deposition behavior and pressure drop across filter media, so it is desirable to investigate the filtration of nanoparticle agglomerates. We performed filtration efficiency and loading test with silver nanoparticle agglomerates. An annealing furnace was used to control the agglomerate structures by varying the annealing temperature. Agglomerate loading test has been conducted with three different annealing temperatures (ambient, 200 °C, 600 °C) in depth filtration region (pre-cake formation). In this region, agglomerate particles show higher pressure drop increase than spherical particles due to their higher air flow resistance and higher particle mass deposition (caused by their lower penetration comparing with spherical particles). Loading test will be extended to cake filtration region (post-cake formation) in the on-going research.

Keywords: Agglomerates, Loading Test, Pressure Drop, Depth Filtration, Cake Filtration

- [1] Endo, Y., D.-R. Chen, et al. (1998). "Effects of particle polydispersity and shape factor during dust cake loading on air filters." Powder Technology **98**(3): 241-249.
- [2] Kittelson, D. B., K. C. Moon, et al. (1984). "Filtration of diesel particles." The Science of The Total Environment **36**: 153-158.
- [3] Song, C. B., H. S. Park, et al. (2006). "Experimental study of filter clogging with monodisperse PSL particles." Powder Technology **163**(3): 152-159. .
- [4] Takagaki, S. S. (2006). Transitional Particle Loading of Air Filter. Mechanical Engineering. Minneapolis, University of Minnesota. **Ph. D.**

[5] Weingartner, E., P. Haller, et al. (1996). "Pressure Drop Across Fiber Filters." Journal of Aerosol Science **27**(Supplement 1): S639-S640.