

The Filtration Performance of Electret PTFE Filter During Soot Particles Loading and Reusability

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Introduction

More and more attention has been paid to the effect of particles deposition on electret filter in long-term performance. Soot particles, which produced by fuel combustion, should be specially considered in the extent to which they cause the loss of efficiency of electret filters. In this study, the filtration performance of charged PTFE needle felt filters (PNFF) during the loading process were investigated using soot particles.

Electret filters are generally considered as a disposable filter media. In this work, the surface potential of the charged PNFFs was measured not only after particle

loading, but also after cleaning up by compressed air. This study aims at better understanding of the dynamic filtration performance of electret filters loaded by soot particles, and evaluation of the reusability of electret filter.

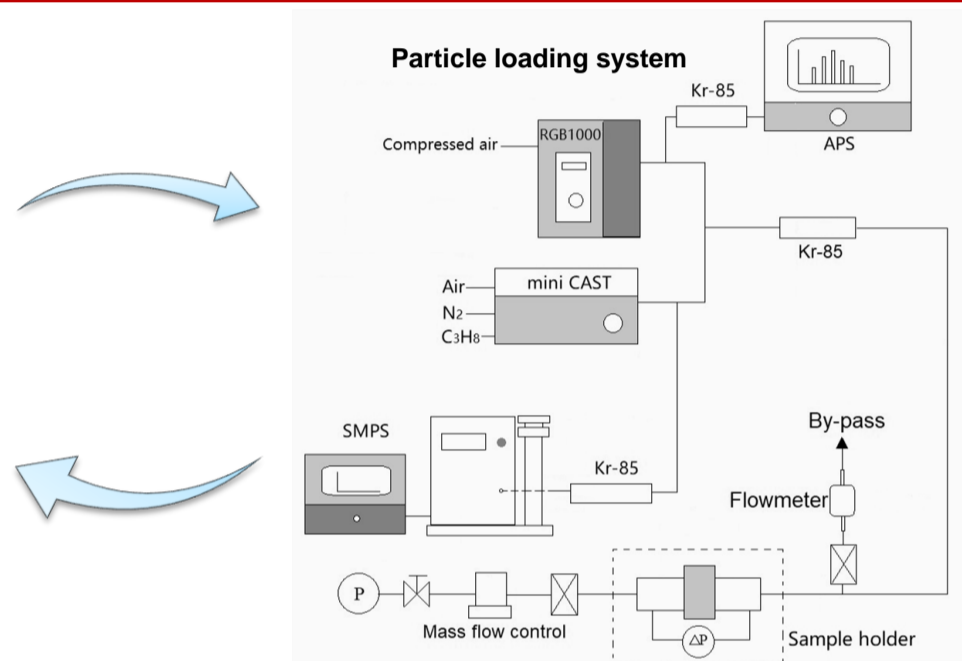
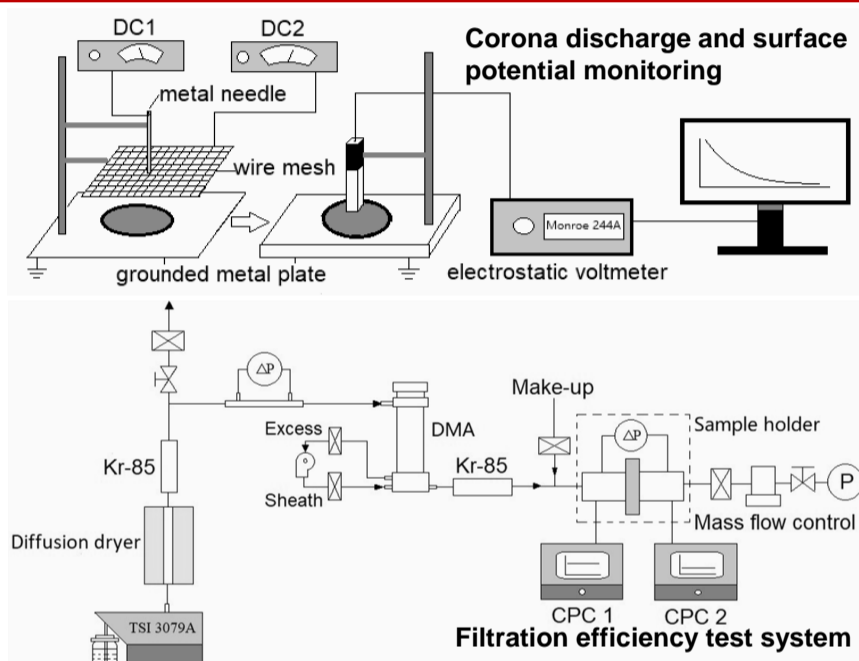
Shi, B., & Ekberg, L. (2015). *Environ Sci Technol*, 49(11), 6891-6898.

Tang, M., et al. (2018). *Sep Purif Technol*, 195, 101-109.

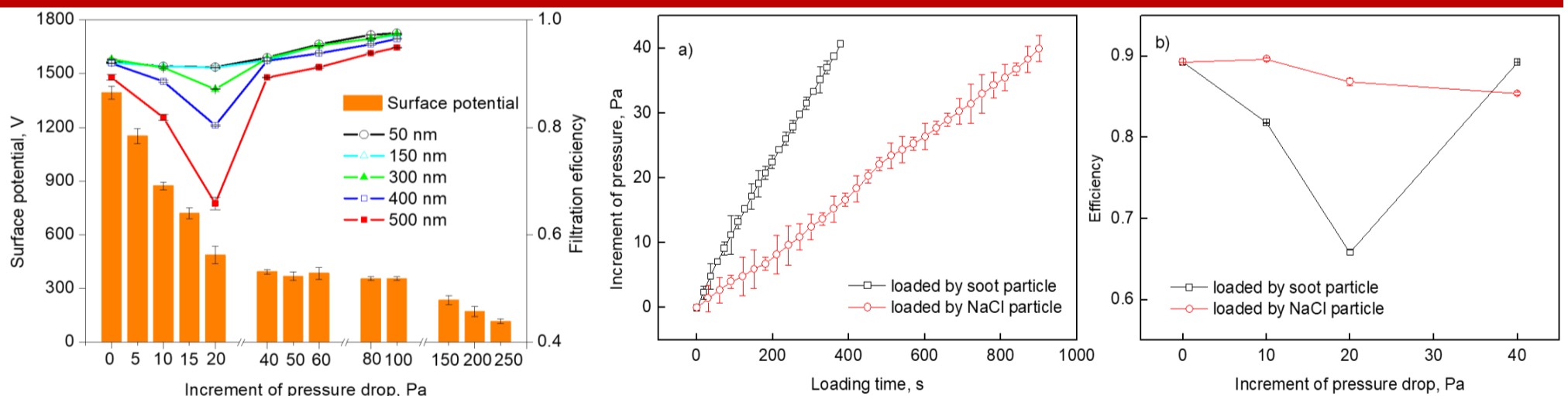
Brown, R. C., et al. (1988). *Ann Occup Hyg*, 32(3), 271-294.

Wang, J., & Tronville, P. (2014). *J. Nanopart Res*, 16(6), 2417.

Methods



Results

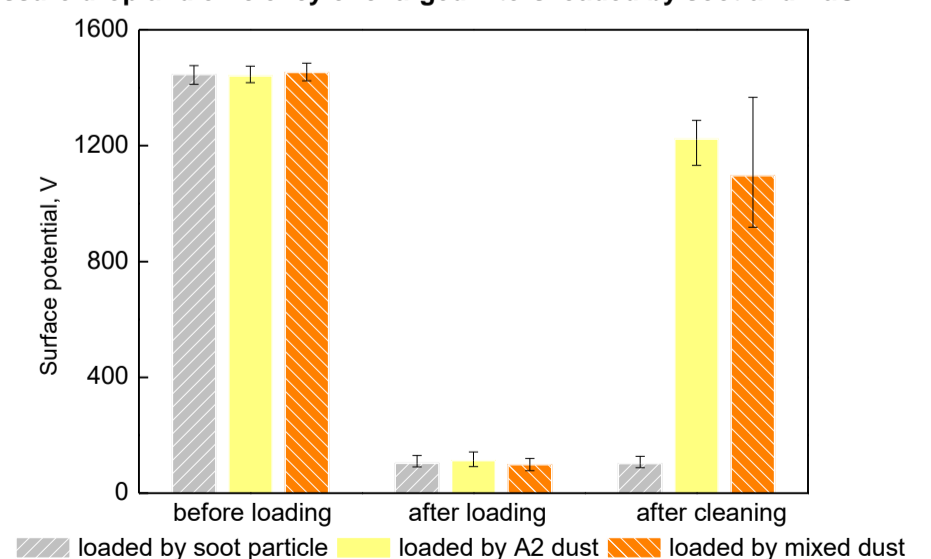


Attenuation of the surface potential and the filtration efficiency of the charged PNFF as function of the pressure drop growth.

The pressure drop and efficiency of charged filters loaded by soot and NaCl

Conclusions

- In the dynamic filtration process, the surface potential of the charged PNFF decreased with particles deposited on the fibers, correspondingly, the filtration efficiency of the charged PNFF declined with the decrease of surface potential.
- The efficiency of charged filters loaded by soot particles decreased first and then increased with a transition point where the pressure drop increase (ΔP) was 20 Pa.
- Due to the higher conductivity of soot particles, the efficiency decay of the filter loaded by soot particle was greater than the filter loaded by NaCl particles.
- The reusability of the electret filter depended on the degree of difficulty in cake removal, and the characteristics of the particles determined the magnitude of the recovered surface potential.



Recovered surface potential of the charged PTFE needle felt filter loaded by soot particles, A2 dust and dust mixture