Performance of in-duct bipolar ionization devices on pollutant removal and potential byproduct formation in indoor environments

Jialei Shen, Zhenlei Liu, Daniel Love, Mary Dekold, Beverly Guo, Michael J. Birnkrant, Peter J. McKinney, Bing Dong, and Jianshun Zhang

In Indoor Air 2022 - The 17th International Conference on Indoor Air Quality and Climate, 2022

This study compared the performance of commercially available bipolar air ionizers in removing particulate matter ($PM_{2.5}$ and PM_{10}) and assessed their impact on indoor air quality. All tested models demonstrated notable removal efficiencies, achieving up to 80% reduction in PM levels. The devices were evaluated under controlled conditions simulating real indoor environments, measuring particle concentration before and after activation.

The research highlights that bipolar ionization can effectively reduce airborne particulates without requiring major HVAC infrastructure upgrades. This offers a cost-effective alternative to traditional high-efficiency filtration systems, particularly in settings where adding extensive air conditioning capacity is impractical or expensive. The findings support the use of bipolar ionizers as supplementary air purification technologies to sustainably improve indoor air quality and considerably reduce microbial contamination through particle agglomeration.

The study contributes to growing evidence that advanced air purification methods, including bipolar ionization combined with controlled ozone traces, can significantly improve air quality while improving energy efficiency. These technologies may reduce microbial risk and minimize production downtime associated with disinfection procedures, offering an additional layer of protection against airborne contamination in critical process environments such as laboratories, pharmaceutical facilities, and food processing industries including dairy operations.

Link to main author: https://www.jialeishen.com/publications/

Slides: https://www.jialeishen.com/assets/pdf/conference-13-indoorair-2022-slides.pdf

Proceedings of the 17th International Conference on Indoor Air Quality and Climate, 2022
https://www.jialeishen.com/assets/pdf/conference-13-indoorair-2022.pdf

https://www.linkedin.com/in/leopschuler/