Comparison of the dust particles number and mass using new sensor module in Clean Unit System Platform (CUSP)

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1. Introduction

For materials science, environmental engineering, or biology, mutifunctional devices are constantly being updated. The importance of these devices cannot be underestimated. In the Clean Unit System Platform (CUSP) study, devices which monitor the number of particles in the air play an indispensable role. In collebration of Hokkaido University (HU) and National Cheng Kung University (NCKU), we have developed a integrated sensor module (NSM), which is not just able to count particles, but also measures the PM2.5 amount in the air and gas molecule concentration. In this paper, we check the relationship between the number of particles and the mass in the air obtained by the NSM, we also exaime the measurement accuracy of the NSM with the convential established devices.

2. Experiment results and discussion

Figure 1 shows the time dependence of particle counts in CUSP. In Fig.1, botton left inset shows a fan filter unit (FFU) and four devices that are set in CUSP. The positions are denoted, for the NSM, as A, for the Lasair, as B, for Metone and DC170, as C and D, respectively. With the FFU being on inside CUSP[1], recording the readings of the four devices at different configurations (ABCD, DABC, CDAB, …, etc.) can reduce the experimental error caused by the position-dependence. Through the experiments, for particle counts at 400/cf and above, it is shown that the data of the NSM has a good linear relationship with those of Lasair. Figure 1 shows the result for one of the configuration. The top right inset shows the dust density has a good linearity with particle counts (100 < perticle counts [1/cf] < 5000). Lasair and Metone are more accurate when high precision is required (or high cleanliness). Although the current NSM is less accurate because of small sampling volume in relatively clean conditions (particle counts < 100), it, is being conpact, demanding small foot-print, can be used in conpact CUSP (T-CUSP) for advanced analyses.

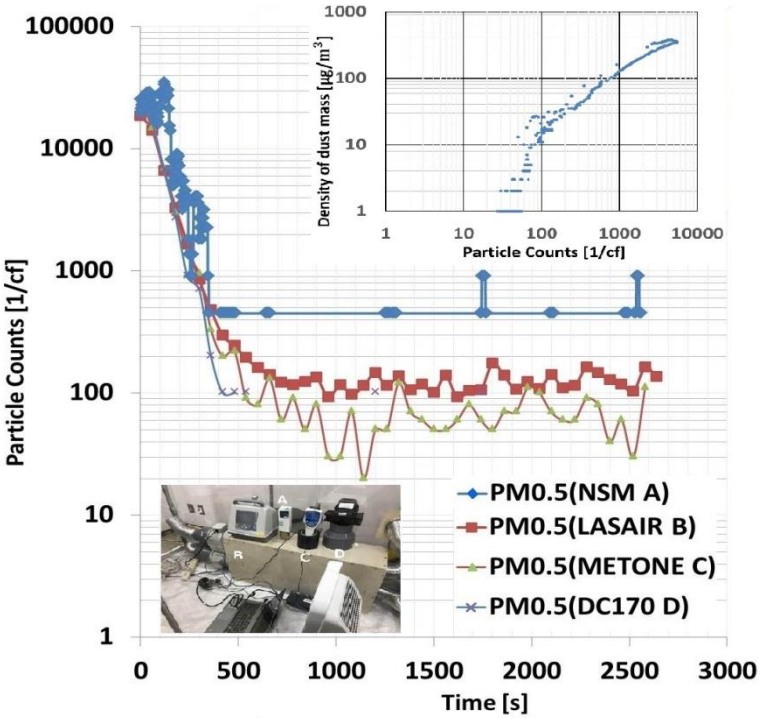

Fig.1 Time-dependence of Particle counts in CUSP; Top right inset: Compraison between particle counts and mass; Botton left:

3. Conclusion

With NSM, experiments become much easier. Knowing the density of dust particles and gas molecule concentration obtained by the NSM, it is possible for us to focus on sleep analysis and indoor environmental cleanliness. These are all related to peoples' health condition, and how to achieve a good health condition and Quality of Life (QOL) is what we are seeking for.

Reference

[1] 石橋　晃、野口　伸守、江藤　月生、松田　順治、大橋　美久　“孤立・閉鎖系高清浄環境クリーンユニットシステムプラットフォーム”　第３５回空気清浄とコンタミネーションコントロール研究大会（早稲田大学国際会議場　2018.04.24）pp.38-41