超微小粒子の壁面への沈着

1988 Fiscal Year Final Research Report Summary

Deposition of Ultra Fine Aerosol Particles on Solid Surfaces

Research Project

Project/Area Number

62550692

Research Category

Grant-in-Aid for General Scientific Research (C)

Allocation Type

Single-year Grants

Research Field

化学工学

Research Institution

Kanazawa University

Principal Investigator

KANAOKA Chikao Professor, Faculty of Technology Kanazawa University, 工学部, 教授 (00019770)

Co-Investigator(Kenkyū-buntansha)

OTANI Yoshio Research Associate, Faculty of Technology Kanazawa University, 工学部, 助手 (10152175)
EMI Hitoshi Professor, Faculty of Technology Kanazawa University, 工学部, 教授 (90025966)

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Clean Room / Particle Deposition / Circular Tube / Wafer / Aerosols / Electrostatic Deposition / Electrically Charged Particles / ブラウン拡散

Research Abstract

Deposition of submicron particles in the manufacturing process of semiconductors is one of the main causes of reducing production yield. In order to suppress particle deposition onto the surface of various materials, the deposition mechanisms of submicron particles have to be well understood. In the present work, first, by using circular tubes made of various materials, deposition of particles in various charging states was experimentally investigated. The tube materials studied were copper, glass, polymethylmetacrylate(PMMA), polyvinylchloride(PVC), pllycarbonate(PC), and polyethylene (PE). As a result it was found that 1) uncharged particle deposits by Brownian diffusion in all the tubes studies; 2) charged particle deposits in PMMA, PVC, PC and PE tubes by coulombic force, and that the dimensionless deposition velocity is equal to the coulombic force parameter derived for charged particle and charged infinite flat surface. Further, from the measurement of time dependency of particle penetration, decay of triboelectric charged on PVC and PC tubes was found to obey the law of hyperbolic decay. Secondly, experimental technique to measure deposition velocity onto wafer for particles with a diameter smaller than 0.3

m was developed by means of fluorometry. Employing the proposed technique, the deposition velocity onto the wafer was measured for charge equilibrium particles and singly charged particles with diameter between 0.03 and 0.8 m at airflow velocity of 0.02-0.5m/s. The measured deposition velocity was compared with that predicted by Liu and Ahn's equation. As a result, it was found that the Lie and Ahn's equation gives a good prediction for particles in the size range between 0.03 and 0.8 m, and , when both the wafer and the particles are charged, the deposition velocity is well estimated by adding the coulombic drift velocity to their equation. Further, through the measurement of the local deposition velocity on the wafer placed normal to the airflow, the deposition hot spots were found to appear on the edge of the wafer and/or at the center of the wafer, depending on the blockage of the wafer to the airflow.
▲ Less

Research Products (4 results)

All Other

All Publications (4 results)

[Publications] 江見準 他: エアロゾル研究. 2. 304-311 (1987)

[Publications] Yoshio Otani,et.al.: Journal of Aerosol Science.

[Publications] Hitoshi Emi; Chikao Kanaoka; Yoshio Otani; Shoichi Fujiya: "Deposition of Charged Submicron Particles in Cicular Tubes Made of Various Materials" Earozoru Kenkyu (Journal of Aerosol Research, Japan). 2. 304-311 (1987)

[Publications] Yoshio Otani; Hitoshi Emi; Chikao Kanaoka; Kaoru Kato: "Determination of Deposition Velocity onto Wafer for Particles in the Size Range Between 0.03 and 0.8 m" Journal of Aerosol Science.

URL: https://kaken.nii.ac.jp/report/KAKENHI-PROJECT-62550692/625506921988kenkyu_seika_hokoku_

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