Particle Adsorption Mechanism during Batch Cleaning Process
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As device shrinks in semi-conductor industry, the frequent change in process scheme is inevitable to solve encountered issues due to the limit of process margin. However, the high number of process steps is inappropriate concerning of the cost for manufacturing a device. Also, as the number of process steps increases, the wafer surface is vulnerable to particle adsorption due to elevated exposure to gas reaction and thermal stress, which induces unpredicted defect during cleaning process. Efficient cleaning method plays a critical role to minimize yield loss in mass production. The particle source might come from the bevel edge debris or photo key formation region of wafer or the bath of cleaning machine. Mostly, flow-like defect map is generally known for the batch cleaning induced particle adsorption. To remove or prevent particle adsorption efficiently, mega-sonic assisted over flow rinse or single typed cleaning machine can be a good candidate. However, in some cases, single typed cleaning cannot substitute batch type cleaning due to its better cleaning performance. The comprehensive study is necessary to minimize batch cleaning induced defect. Depending on the material, surface chemical state and pH, zeta potential shift to the direction preferable for either particle adsorption or desorption. The unpredicted surface modification by previous process step, especially etch process, can be easy target for particle adsorption in certain chemicals. Therefore, the knowledge for the mechanism of particle adsorption during batch cleaning process can contribute to improved yields in semi-conductor industry.

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