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In-Situ Dry-cleaning (ISD) Monitoring of Amorphous Carbon Layer (ACL) Coated Chamber

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In the era of 45 nm or beyond technology, conventional etch mask using photoresist showed its limitation of etch mask pattern collapse as well as pattern erosion, thus hard mask in etching became necessary for precise control of etch pattern geometry. Currently available hard mask materials are amorphous carbon and polymetric materials spin-on containing carbon or silicon. Amorphous carbon layer (ACL) deposited by PECVD for etch hard mask has appeared in manufacturing, but spin-on carbon (SOC) was also suggested to alleviate concerns of particle, throughput, and cost of ownership (COO) [1]. SOC provides some benefits of reduced process steps, but it also faced with wiggling on a sidewall profile. Diamond like carbon (DLC) was also evaluated for substituting ACL, but etching selectivity of ACL was better than DLC although DLC has superior optical property [2]. Developing a novel material for pattern hard mask is very important in material research, but it is also worthwhile eliminating a potential issue to continuously develop currently existing technology. In this paper, we investigated in-situ dry-cleaning (ISD) monitoring of ACL coated process chamber. End time detection of chamber cleaning not only provides a confidence that the process chamber is being cleaned, but also contributes to minimize wait time waste (WOW). Employing Challenger 300ST, a 300mm ACL PECVD manufactured by TES, a series of experimental chamber cleaning runs was performed after several deposition processes in the deposited film thickness of 2000Å and 5000Å. Ar Actinometry and principle component analysis (PCA) were applied to derive integrated and intuitive trace signal, and the result showed that previously operated cleaning run time can be reduced by more than 20% by employing real-time monitoring in ISD process.

참고문헌

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