

Sensitivity Enhancement of SiO₂ Plasma Etching Endpoint Detection Using Modified Gaussian Mixture Model이성현¹, 채희엽^{1,2,†}, 이상인³¹성균관대학교; ²화학공학과; ³AMK(hchae@skku.edu[†])

In the plasma etching process, endpoint detection (EPD) is important that minimizes the overetching damage of the underlying layer by stopping the etching process at the appropriate moment. Several multivariate analysis techniques, like principal component analysis (PCA) and K-means cluster analysis (KMC) have been developed to improve the sensitivity of optical emission signals for EPD. In this study, Gaussian mixing model (GMM) was modified and implemented to determine the real-time endpoint of SiO₂ plasma etching using optical emission spectral analysis, compared with KMC. Optical emission spectroscopy (OES) signals were collected from SiO₂ plasma etch processes and the modified GMM was applied to the SiO₂ etch by relative area. The sensitivity of the OES signal was improved ~5.5 times with the modified GMM. We also improved the sensitivity with selected 60 peaks and GMM analysis modified with 60 reactant-related peaks showed the enhancement of 40% in the sensitivity than that with 6144 full-spectral OES signals. This work demonstrated that the modified GMM is an effective clustering technique for etching endpoint detection.