Machine Learning of Micro/macro Cavity Data for Etching Recipe Optimization HYAKKA NAKADA, MASARU KURIHARA, MASAYOSHI ISHIKAWA, TATEHITO USUI, NAOYUKI KOFUJI, TAKESHI OHMORI, Hitachi, Ltd. Research Development Group — Semiconductor manufacturing processing has been complexed and the process development period has been prolonged with the progress of device structure from 2D to 3D. The long development period causes the increase of the device cost. In plasma etching process, a set of the control parameters of etcher is called as recipe. Rapid optimization of the recipe to obtain a target profile has been required to reduce the development period. A recipe exploration method based on machine learning of feature data related to etching profile is developed to accelerate the recipe optimization. Micro/macro cavity method [1] is used to extract the feature data. An approximately region to obtain a vertical etching profile as a target can be determined in the feature data space because the feature data show the characteristics of ion assist etching and radical etching. The correlation between the feature data and recipes is learned by a machine learning model. The recipes for the vertical profile are predicted by the learning model. Three recipes to etch the vertical profile were found from only seven times of Si trench etching using the recipes predicted by the learning of 60 sets of the feature data. [1] K. Watanabe and H. Komiyama, J. Electrochem. Soc., vol. 137 (1990).

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