Feasibility study for eliminating blisters induced by extreme ultraviolet light (EUVL)

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Abstract

Currently, the development of extreme ultraviolet light (EUVL) has made substantial contributions to the miniaturization in semiconductor industry. However, extremely high energy of 9.2 eV excites molecules or atoms to create highly reactive ions or ligands. Especially, excited hydrogens (i.e., plasma) accumulate between absorption layer and capping layer in some part of the photomask or equipment through an electric field induced by photomask clamping voltage. Continuous exposures of light increase number of accumulated hydrogen ligand and form blisters between layers. This paper shows real void captured by transmission electron microscopy (TEM) (Fig. 1). We research from the generation mechanism to prevention methods of voids that can trap excited hydrogen. In addition, we create holes for evacuating trapped hydrogen ligands. We believe that the proposed system will provide eliminating blisters in EUV photomask.

References

[1] Tomuro, H., Ji, M., Nagata, R., Kouge, K., Yanagida, T., Morita., … & Yoshitake, T., Plasma and Fusion Research, (2022) 1406005
[2] Rastegar, A., & Jindal, V., 28th European Mask and Lithography Conference, (2012) 306-317.
[3] Burns, J., & Abbas, M., Photomask Technology, (2010) 1017-1021.
[4] Kuznetsov, A. S., Gleeson, M. A., Van de Kruijs, R. W. E., & Bijkerk, F., Damage to VUV, EUV, and X-ray Optics III, (2011) 253-260.

Figures

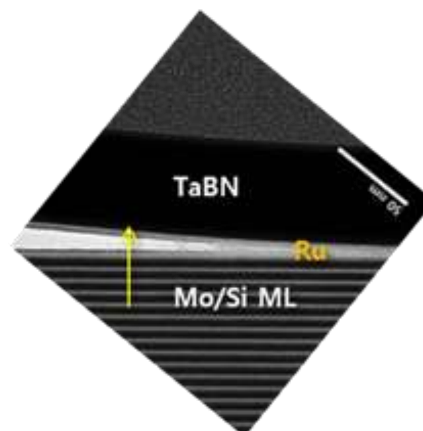

Figure 1: The Difference in thermal expansion coefficient creates a void in which activated hydrogen can trap.