

Abstract Submitted
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Layer by layer etching of LaAlSiO_x MITSUHIRO OMURA, KAZUHITO FURUMOTO, KAZUHISA MATSUDA, TOSHIYUKI SASAKI, IT-SUKO SAKAI, HISATAKA HAYASHI, Toshiba Corporation — In order to fabricate a gate transistor with high-k oxide materials, removal of high-k oxide films after gate electrode etching is necessary for the formation of ohmic contacts on source and drain regions. It is crucial that the removal process of high-k oxide film by dry etching is highly selective to and low in damage to the Si substrate in order to avoid the degradation of device performances. Sasaki et al. have achieved a high LaAlSiO_x-to-Si selectivity of 6.7 using C₄F₈/Ar/H₂ plasma [1]. A sequential layer by layer etching could realize low damage etching, similar to atomic layer etching. Therefore, a sequential LaAlSiO_x etching process using a H₂ surface modification step followed by a removal step using C₄F₈/Ar plasma is investigated. The etched amount of LaAlSiO_x by the C₄F₈/Ar plasma step doubles with H₂ modification. It is confirmed that when the C₄F₈/Ar plasma treatment time is sufficient to remove the surface modification layer, a self-limiting reaction is realized. Furthermore, it is confirmed that the etched amount per step can be controlled by control of the ion energy of H₂ plasma.

[1] T. Sasaki, K. Matsuda, M. Omura, I. Sakai, and H. Hayashi: Jpn. J. Appl. Phys. 54 (2015) 06GB03.

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