Improvement on Interface Quality and Reliability Properties of HfAlOx MIS Capacitor with Dual Plasma Treatment

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Abstract

HfO2 is considered a promising gate dielectric material for sub-45 nm CMOS technology. It has been reported that incorporate Al into HfO2 forming Hf aluminates in order to increase the crystallization temperature. However, the growth of the low-k interfacial layer at high-k/Si interface during high-k dielectric deposition would result in reliability degradation. Recently, incorporating nitrogen into HfAlOx gate dielectrics has beneficial effect on reliability performance. In addition, fluorine incorporation into high-k dielectrics also could have several improvements. In this study, dual plasma (CF4 pre-treatment and N2 post-treatment) was performed on HfAlOx MIS capacitor in order to improve interface quality and the reliability properties. According to our experimental results, dual plasma treatment could improve interface quality and enhance reliability properties of HfAlOx thin films.

Keyword：HfAlOx, MIS Capacitor, Dual Plasma Treatment