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Author: M. Kopani M. Mikula E. Pinčík H. Kobayashi M. Takahashi

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FT IR spectroscopy of silicon oxide and $HfSiO_x$ layer formation

M. Kopani[1], M. Mikula[2], E. Pinčík[3], H. Kobayashi[4], M. Takahashi[4]

[1]Comenius University, Sasinkova 4, 811 08 Bratislava, Slovakia

[2]Faculty of Chemical and Food Technology of STU, Radlinského 9, 812 37 Bratislava, Slovak Republic

[3]Institute of Physics of SAS, Dúbravská cesta 9, 845 11 Bratislava, Slovakia

[4]Institute of Scientific and Industrial Research, Osaka University and CREST, Japan Science and Technology Organization, 8-1, Mihogaoka, Ibaraki, Osaka 567-0047, Japan

ABSTRACT

Hafnium oxide is an interesting material for a broad range of applications. Infrared spectroscopy was used to study the impact of aqueous environment and mechanism of formation of 5 nm HfO_2 films after nitric acid oxidation (NAOS) of n-doped Si (100) substrates. Samples were annealed in N_2 atmosphere at different temperatures 200°C - 400°C for 10 min. For NAOS passivation 100% vapor of HNO_3 (set A) and 98% aqueous solution (set B) was used. FTIR measurements reveal silicon oxide layer formation and formation of $HfSiO_x$ layer. There are differences in $HfSiO_x$ layer formation between samples of set A and B caused by different environment. This layer of samples set B is thinner because of Si-OH bonds that may inhibit formation of this layer. Absorption IR spectra of set A show more ordered SiO_x layer in comparison with samples of set B. The structural properties of HfO_2 are crucial for application in the future.

Key words: hafnium oxide, silicon oxide, infrared spectroscopy