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In-situ XPS study of UHV-Atomic Layer Deposition of TiO_2 thin films on Si substrates using titanium isopropoxide and water

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Reaction mechanism between titanium isopropoxide ($Ti(OCH(CH_3)_2)_4$) and water (H_2O) in the ultrahigh vacuum(UHV)-atomic layer deposition(ALD) of TiO_2 on Si substrates were studied by using in-situ analysis of X-ray photoelectron spectroscopy(XPS). It has been found that the exchange reaction of titanium isopropoxide with water is imperpect at room temperature. At 15 0℃ the surface reaction of titanium isopropoxide is not self-terminated and titanium-silicate thin film is formed. It can be seen that titanium isopropoxide occured self-terminated reaction on Si substrate coated with self-assembled monolayers (SAMs) containing hydroxy terminal group.

It can be seen that the surface reaction of titanium isopropoxide is not self-terminated and titanium silicate thin film is formed at a temperture of 150℃, while titanium silicate is not formed when hydroxy terminated self assembled monolayers coated on Si substrates at a temperture of 150℃