PW-P17

Effect of Multiple Radio-Frequency on Sputter Etching in Dual Coil Inductively Coupled Plasma Etcher

Haegyu Jang[1], Min-Shik Kim[2], Kun-Joo Park[2], Heeyeop Chae[1*]

[1]Department of Chemical Engineering, Sungkyunkwan University, Suwon, 440-746, Korea
[2]DMS, Semiconductor Business Divison, Suwon, 443-803, Korea

Multiple frequency are widely used in various commercial plasma etchers, recently. However, their interaction of multiple frequency powers is not clearly understood at this moment. The interaction of multiple radio frequency in dual coil inductive coupled plasma (ICP) etcher was characterized by analyzing SiO_2 sputter etching process in this work. SiO_2 sputter etching with Ar plasma was adopted for physical characteristics. Sputter rate was modeled with ion-limited etch rate model. Sputter etch rate was measured by varying source and bias powers. 13.56MHz RF power was applied as source power which was delivered through a dual coil, and 2MHz and 27MHz RF powers were applied as bias powers. We tried to control Ar plasma density with 13.56MHz source power and 27MHz bias power, and to control ion bombardment energy with 2MHz bias power and 27MHz bias power. Plasma density was measured with a non-invasive probe and ion energy was determined from DC self bias. The sum total of bias power was 1000W fixed, while 2MHz-27MHz bias power ratio was changed. Ar plasma density was confirmed to be mainly increased by 13.56MHz source power, and it was increased with 27MHz bias power when no source power was applied. However, Ar plasma density was not influenced by 27MHz bias power when 13.56MHz source power was more than 300W. DC self bias energy was mainly controlled by 2MHz bias power when the source power was below 300W. However, 2MHz bias power did not show much effect on DC bias energy when source power was higher than 300W, because DC self bias was decreased with increased 13.56MHz source power or 27MHz bias power.