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The influence of electrode surface condition on the discharge properties in a capacitively coupled plasma

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In this presentation, we report recent experimental results on the time evolution of emission intensities in a capacitively coupled argon/krypton discharge, during a time period when the surface condition of the powered electrode is changing. The powered electrode, made of aluminium, initially has an oxide layer of a few nanometers in thickness, which is being removed during the discharge by argon ion bombardment. While the oxide layer being sputtered off, we observe a change of discharge characteristics over a time scale of hundreds of seconds. By using the rate balance equation of several argon excited species, the global discharge model and an equivalent circuit model, we study the effect of this sputtering process on the discharge characteristics. In particular, the change of the following quantities and the correlations among each other will be investigated: density of excited state, the variation in the absorbed power, electron density, density of sputtered materials, the secondary electron yield of the powered electrode, the sheath thickness and the density of argon metastables. The results from the models are compared with that observed in the experiment.