**Mass-spectrometric measurements of ion flux at a substrate   
in reactive HiPIMS processes**

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Reactive high-power impulse magnetron sputtering (HiPIMS) process is characterized by a rich spectrum of interesting effects that on the one hand require sophisticated experimental investigations and in-depth modeling, while on the other hand have significant influence on its technological applications. Among these effects, the most notable are features of process hysteresis that are different from that of conventional magnetron discharges (DC, or mid-frequency) [1, 2]. Using a hot-target magnetron increases the number of effects that one needs to account for to build a reliable model of the target state, even in DC mode [3]. However, besides detailed investigations of magnetron target conditions, the characteristics of substrate region are highly important as they are directly connected with properties of growing film [4].

We have measured the mass-resolved flux of ions originating from hot-target reactive HiPIMS plasma and arriving at grounded substrate. Magnetron targets were made from Cu, Cr, and Si. HiPIMS discharge was operated in O2/Ar mixtures for Cu and Si targets, and in N2/Ar mixture for Cr target. For these target/gas pairs, the composition of ion fluxes from plasma was measured by a custom magnetic mass-analyzer as a function of the reactive gas flow. The behavior of different fractions is analyzed and discussed.

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References

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