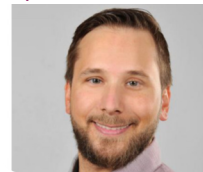


Sci. Assessment of Internal Coatings in CLUSTERLINE®200: Quantif. Particle & Cost Perform.

Diplomand



Christoph Bachofner

Ausgangslage: Particle contamination is a significant factor affecting process quality and production yield in sputtering processes. During operation, coatings accumulate on shielding components, particularly on the shadow ring. Mechanical, thermal, or electrical stresses can cause these deposits to become particle sources, leading to defects on coated wafers. The objective of this thesis was to investigate the influence of different coating concepts on particle generation in an SiO₂ sputtering process on the CLUSTERLINE® 200 platform manufactured by Evatec AG.

Vorgehen: Six experimental series with different shadow-ring configurations were conducted. The investigated variants differed in terms of surface roughness, TWAS coating thickness, and surface pretreatment. The evaluation was based on shortened marathon tests representing a reduced shield lifetime. In addition to particle development, process stability, film thickness distributions, and stress distributions were analyzed. Furthermore, selected particles were characterized using FIB/SEM and EDX analyses, while the hardware condition and the economic performance of the investigated coating concepts were also evaluated.

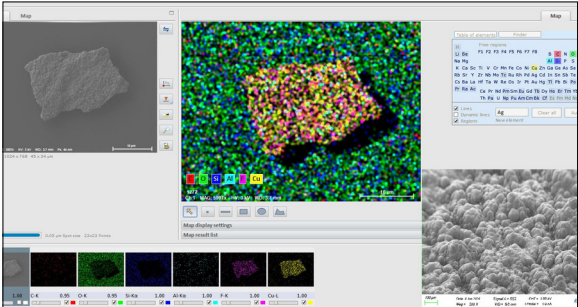
Ergebnis: The results demonstrate that the condition of the shadow-ring surface has a significant influence on particle generation, process stability, and hardware condition. High surface roughness led to increased particle formation and higher arcing activity. The lowest particle contamination was observed for a TWAS-coated configuration with a surface roughness of Ra 13–14 µm and a coating thickness of approximately 130 µm. Overall, the results show that a balanced combination of surface roughness, coating thickness, and mechanical stability is

essential for achieving low particle contamination and stable industrial operation. The investigated TWAS configuration represents the most promising solution for industrial implementation.

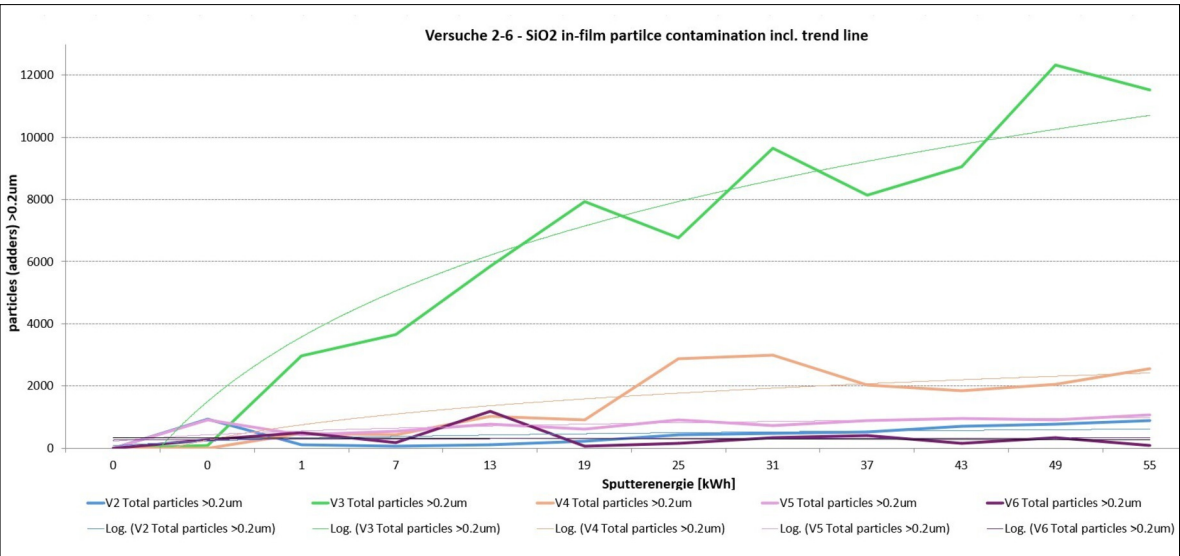
Shielding set with shadow ring.
Eigene Darstellung



FIB/SEM-EDX analysis of a copper/fluorine particle and FIB/SEM image of a TWAS coating.
Eigene Darstellung



Comparison of particle count development and corresponding trendlines for the investigated shadow-ring configurations.
Eigene Darstellung



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