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**PVD and PACVD-SiCN-based Coatings for Ultra High Thermal Loads:  
Comparison of Structural, Mechanical and Thermal Properties**Casper Pusch<sup>1</sup>, Holger Hoche<sup>1</sup>, Ralf Riedel<sup>2</sup>, Emanuel Ionescu<sup>2</sup>, Cladia Fasel<sup>2</sup>,  
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SiCN materials exhibit excellent resistance to oxidation, chemical decomposition and structural changes even at temperatures above 1300°C. However, the properties of the SiCN films depend very much on a variety of parameters like synthesis process and composition as well as on the nano/microstructure of the amorphous network. So far, the available data in the literature allows neither a reliable comparison between the different synthesis methods for SiCN materials and their resulting properties nor an identification of the possibilities to tailor the film properties by synthesis method and synthesis parameters.

Thus, SiCN-based film materials were synthesized by DC- and HiPIMS-PVD sputtering and by PA-CVD process using the single-source precursor HMDS. The coatings as well as the coating-substrate compounds were subjected to a comprehensive examination of their property profiles. A special focus was set on the examination of the high-temperature behavior of the SiCN materials.

The presented results allow the description of the relationship between the synthesis method and the chemical, structural and mechanical properties as well as the high-temperature behavior of SiCN materials.

**Keywords**

SiCN

HiPIMS

PVD-Sputtering

PA-CVD

High Temperature