

SEMINAR I

Thursday, 21.5.2026, 12:30 , MPŠ Lecture room

Preparation of Highly Filled Suspensions for Digital Light Processing of SiC Ceramics

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Digital light processing (DLP) is an additive manufacturing technique that enables the fabrication of highly complex ceramic components with high precision and good surface finish. While this technology is already well established for oxide ceramics such as Al_2O_3 , ZrO_2 , and SiO_2 , the processing of non-oxide ceramics, particularly silicon carbide (SiC), is significantly more challenging.

SiC ceramic is an attractive material for demanding applications in aerospace, defence, energy, chemical processing, and wear-resistant components, due to its excellent thermal stability, chemical resistance, hardness, wear resistance, and mechanical strength. However, the strong light absorption of SiC powder and its high refractive index limits its DLP processing. Additionally, the difficult sintering behaviour of SiC requires careful feedstock design to enable high densification after thermal processing.

This seminar reviews the main challenges related to the preparation and printing of highly filled SiC photocurable suspensions, with emphasis on the influence of powder properties, particle size, solid loading, and dispersion quality on rheological behaviour, sedimentation stability, cure depth, and sintering ability. Several studies indicate that additional densification strategies are required to obtain dense ceramic products. However, these approaches often result in poorer final thermal and mechanical properties compared with conventionally solid-state or liquid-phase sintered SiC ceramics. Promising approaches, such as surface modification of SiC particles by partial oxidation or oxide coating, can improve the printability of SiC suspensions and could enable the use of conventional sintering routes. Nevertheless, a systematic understanding of the relationship between powder modification, suspension properties, cure depth, and final ceramic density is still limited. Therefore, further research should focus on balancing printability with densification in order to enable the production of dense SiC components with high final properties.

Kindly invited.