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## Towards multielement core-shell ceramics in the Zr/Si/C system

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In the race for high-performance materials, the non-oxide ceramics have a special position. Particularly, zirconium carbide (ZrC) and silicon carbide (SiC) are known as high refractory ceramics with interesting thermomechanical properties. In ZrC-SiC composites, the combination of the passivating character of silicon carbide and the high melting temperature, hardness and thermal stability of zirconium carbide, should lead to high-performance ceramics. To fabricate such materials, a polymer-derived ceramic (PDC) route may be a promising way to avoid chemical heterogeneity and obtain high performance composites with a homogeneous microstructure. Here, the idea was to use a chemical process to access ZrC-SiC composites presenting for example an original architecture such as a core-shell form, consisting of a core of ZrC covered with a layer of SiC. To reach this composite, steps of functionalisation and polymer grafting could be performed onto the ZrC surface, to covalently attach macromolecules on the ceramics, and to ideally confine the pyrolysed SiC ceramic onto ZrC. During these syntheses, a control of several physicochemical characterisations will be needed, such as the rheology and the chemical composition of these organic-ceramic systems. In this way, a DFT approach of ZrC surfaces, as well as a Rheo-FTIR study of the original polymeric precursors, will be described. Furthermore, a focus will be systematically established on the thermal behaviour and the microstructural evolution of the material.

### Biography

Romain Lucas has completed his PhD from the University of Limoges (France). He is a Lecturer at the Laboratory SPCTS in the group "Ceramics under environmental stresses", where he takes care of the transversal team "Synthesis and functionalisation". His current research interests is in the "High Performance Ceramics" team, focused on: the syntheses of original preceramic polymers in the Zr/Si/C system, including a core-shell approach; the role of the interfaces between ceramic and organic materials; and the sintering abilities of these new hybrid materials. He is the author and co-author of 28 publications.

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