

1	CEIPEX RESEARCH TOPIC LEVEL2: advanced ceramic materials, polymers & composites
2	RESEARCH GROUP: Advanced Multifunctional Ceramics (K. Maca)
3	TOPICS/FOCUS Upcycling of ceramic waste to produce carbide-based ceramics
4	SUMMARY Grinding sludges from machining of advanced ceramics accumulate worldwide as costly and often hazardous waste streams that are rich in valuable materials (e.g., B₄C, SiC and synthetic diamonds), but contaminated by coolants, binders, and fines that hinder straightforward reuse. Landfilling or incineration of these sludges forfeits critical raw materials, carries long-term environmental liabilities, and exposes producers to tightening regulations and disposal fees. Meanwhile, demand for hard, wear- and corrosion-resistant non-oxide ceramics continues to rise, yet primary powders remain expensive and energy-intensive to produce. The objective of this project is to find the most effective processing route to upcycle industrial waste ceramic grinding sludges into a clean, formable feedstock and then into high-performance, non-oxide (carbide) ceramics for various applications. Upcycling sludges into high-quality powder feedstocks addresses three converging pressures — resource efficiency, compliance and risk reduction, and decarbonization — by closing material loops, reducing embodied energy and CO₂, and creating a reliable, lower-cost route to produce advanced ceramic components without compromising their performance. This project delivers technological innovation and environmental benefits by valorising industrial waste and introducing a novel class of materials. The outcomes will be validated from laboratory to pilot scale, with attention to input variability, quality control, and readiness for industrial adoption.
5	RG WEBPAGE: https://www.ceitec.eu/advanced-multifunctional-ceramics/rg388