DESIGN AND TECHNOLOGY. PEOPLE, SYSTEMS, ENVIRONMENT

Ateneo/DISEG - Systemic design and recycling of stone derivatives. Design of sustainable artefacts for new living paradigms

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Context of the research activity	The research topic focuses on the recycling of secondary raw materials (SRM) from the stone industry supply chain. The research also includes application experimentation using parametric drawing tools and 3D printing prototyping with mixtures derived from mix design solutions studied in the laboratory and test about different kind of performances (at laboratory scale and on site). A further theme is the development of a production process 'model' that can be applied in other contexts with similar by-product and waste management issues.
	The research theme stems from the need to recycle secondary raw materials (SRM), consisting of by-products and waste from local stone production chains, to be recovered according to a systemic approach and with added value for the design of new systems and subsystems of artefacts for living spaces (indoor and outdoor), also for the sustainable development of productive communities. In addition to theoretical and methodological explorations, the research includes experimental application using parametric design tools (2D and 3D), prototyping with 3D printing of different types of mixtures derived from mix design solutions studied in the laboratory and test on different kind of performances of the prototypes realized (for the optimisation of these). Another objective of the research is to create a production process "model", as initiated in similar research in the past, that can be applied in other contexts - Italian and European - with similar production missions and similar by-product and waste management problems. Part of the research activity will be devoted to complementary aspects in the area of waste and by-product production data collection, the examination of

Objectives	current legislation and regulations and, in summary, to the following topics: • Investigate materials and their potential in terms of durability, mixed use compatibility, physical and mechanical performance, sensory and expressive properties. • Achieving 'end-of-waste' status for the waste categories considered in the research pathway; • Possible uses of materials from a ‘cradle-to-cradle’ perspective and evaluation of supply chain paths from an LCA perspective; • Assessing the cost of production processes and marketing of new products or systems; • Environmental spin-offs resulting from the adoption of virtuous processes; • Technology transfer to other national or supranational contexts; • Practical laboratory application activities (on mixing and testing activities). Based on these premises, the figure to be identified for the development of the research must have a background in planning and design, preferably enriched by documented previous experience in these scientific and/or professional fields. This person will also be called upon to integrate the competences with the transversal, interdisciplinary and complementary topics that constitute one of the specificities of the training offered by the PhD in Design&Technology. The research can be based on a rich background of experience (theories, methodologies, patents and applications) acquired on this subject by tutors and co-tutors from different disciplinary fields. This documentation will be made available to those who will follow this path, with the aim of study-ing and developing aspects that need to be further developed in line with sustainable and technological progress in this field. In fact, the research activity also aims to systematise the progress of different disciplinary experiences, to make the person involved acquire teamwork skills and to collaborate with external production realities that co-finance the scholarship. The research pathway will involve the direct involvement of an external partner who will be the privileged interlocutor for the doctoral student's activities, in full synergy with the reality of the area, for an innovative response to the current challenges of transition. As an external partner, ASSOGRANITI VCO has been identified, a trade association representing the main companies in the stone sector (quarrying and working) in the Verbano Cusio Ossola area. Thanks to the great experience of its members and the long tradition to which it is heir, ASSOGRANITI is a point of reference and comparison for companies, professionals and institutions.

Skills and competencies for the development of the activity	The identified person must have the following skills - the ability to follow the experimental paths of the laboratory, using different equipment and with different levels of complexity of use; - Knowledge of the most common stone materials and in particular those of the external partner's reference area (VCO); - Knowledge of parametric design and the ability to apply it to three-dimensional printing with experimental conglomerates.