SUSTAINABLE MATERIALS, RECYCLING AND ENVIRONMENT

RESEARCH GROUP: Maria Chiara Bignozzi, Elisa Franzoni, Stefania Manzi, Antonio Motori, Andrea Saccani

KEYWORDS: industrial waste, waste, eco-cements, durability

With the aim to obtain materials with high durability and good performances for civil engineering, the research is focused on the mix-design and characterization of sustainable materials (i.e. concrete with eco-cements, sulphur concrete, concrete where natural aggregates are replaced with construction and demolition waste and/or end-use tyre rubber, fiber reinforced composites, etc.). Innovative and sustainable materials are designed combining high durability features with the introduction of waste materials in the mix design. Mix-design, physical and mechanical properties, microstructure, alkali-silica reaction (ASR), durability in aggressive environment, and protection against corrosion are studied to design composite materials with tailored properties. Porosity and its distribution are investigated by means of mercury intrusion porosimetry and microscopy techniques. Tailoring the porosity through the optimization of the mix-design allows tuning the mechanical properties and the density of the final product.

As to what concerns sustainable fiber reinforced composite materials the use of natural fibers (hemp or straw) in hybrid organic-inorganic matrices is investigated. The research on recycling of waste and by-products for the development of building materials is often supported by industrial partners in view of the application of the circular economy fundamentals. Recycling contributes to the valorization of waste and reduction of environmental impact, thus avoiding waste landfill disposal and use of non-renewable resources. The treatment and use of construction and demolition waste, and the recycling of waste wash water coming from ready-mix concrete plants, of ceramic industry by-products, of end-used tyre, of glass waste from separate collection, of ashes from incineration of municipal solid waste, of polymeric and agricultural waste, etc., are investigated. These by-products have been successfully used as new constituents for ecocements, fiber reinforcement, aggregates and filler for ordinary and self-compacting concrete. In the field of materials for architecture, new methodologies have been set up. They concern the evaluation of construction materials sustainability and new systems of integrated design for the reduction of environmental impact related to the construction and building service life (energy saving, renewable energy sources available on-site, etc.).
MAIN PUBLICATIONS


LINKS AND CONTACTS

maria.bignozzi@unibo.it
elisa.franzoni@unibo.it
stefania.manzi4@unibo.it
antonio.motori@unibo.it
andrea.saccani@unibo.it