

VALORIZATION OF VARIOUS CONSTRUCTION AND DEMOLITION WASTE STREAMS AS PRECURSORS OR ADDITIVES OF CONSTRUCTION ELEMENTS AND MATERIALS

D. Kioupis, A. Skaropoulou, S. Tsvilis, G. Kakali*

School of Chemical Engineering, National Technical University of Athens

(*kakali@central.ntua.gr)

ABSTRACT

The rapid growth of the construction industry worldwide during the past decades has resulted to an enormous increase of the produced Construction and Demolition Wastes (CDWs). The composition of the CDWs varies depending on its origin (construction, renovation, repair or demolition of structures) and often contains bulky and heavy materials, including concrete, wood, asphalt, gypsum, metals, bricks, glass, plastics, etc. In European Union, the construction sector produces 850 million tons of waste per year, which represents 31% of the total waste generation^[1]. According to the binding legislation set by the EU, 70% by weight of non-hazardous CDW has to be prepared for re-use, recycled, or recovered by the year 2020^[2].

In the frame of GREENINSTRUCT project, funded by the European Union Horizon 2020, CDW materials with high technical and economic potential were identified. CDW waste streams such as concrete, ceramics, plastics, textiles, glass, wood and insulating materials were selected, processed and examined as alternative precursors or additives in conventional and novel construction elements and materials.

Ceramic wastes (bricks and tiles) were used as precursors for the development of construction elements through alkali activation. The activation solution was prepared through the alkaline dissolution of glass waste. Wastes originating from insulating materials (expanded polystyrene and extruded polystyrene) were incorporated in order to reduce the weight, while fibers produced from polyethylene wastes were added in order to improve the mechanical performance. The final product contains more than 90% per weight of CDW materials.

Recycled aluminum from CDW was re-processed by extrusion to manufacture modular pre-fabricated aluminum profiled elements.

Plastic, wood and textile wastes were processed in order to produce fibres to be incorporated as reinforcement in cementitious, insulating and adhesive materials.

Recycled polyurethane foam was examined as additive in pristine PU foam in order to reduce its cost and improve its performance and as a lubricant for extrusion processing.

Recycled concrete aggregates encapsulating PCMs were introduced in cementitious materials in order to improve their energy performance.

Finally, CDW fillers and fibers were incorporated in structural adhesives.

This paper provides an overview of the processing of the above mentioned CDW streams and the main features of the developed products.

LITERATURE

- [1] European Commission (DG ENV), Final Report Task 2Service Contract on Management of Construction and Demolition Waste, 2011 (ENV.G.4/FRA/2008/0112).
- [2] European Commission. COMMISSION STAFF WORKING DOCUMENT Accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Thematic Strategy on the Prevention and Recycl 2010:72.