

ABSTRACT

In the field of Civil Engineering, there is a constant research for improving the characteristics of cementitious based materials and the application of different types of fibers for reinforcement, particularly since the use of asbestos is not permitted.

The application of synthetic fibers is a part of these continuous researches, and there are some of them whose results have been approved and their commercial uses have been established, for example in the case of polypropylene.

At the same time, the final destination of waste is still a worrying issue because the increase of their generation and the big amount of physical and economic resources required for this purpose.

In the present work, we study the valorization of synthetic fibers derived from post-consumer waste when they are used as reinforcement of cement matrices.

Used fibers are made from post-consumer polyethylene terephthalate (PET) and high density polyethylene (HDPE) packages, mono and multi-strand filaments used in brooms production and those obtained from the waste generated at the facility and the replacement of wires in telecommunications systems (optical fiber).

The physical and mechanical characterization of these waste materials were carried out, and also the study of their durability when immersed in alkaline environment, and particularly in cement matrices.

To prepare samples of mortar reinforced with fibers from these residues, prismatic specimens were cast and tested by bending and compression procedures. These tests

allowed to determine the relationship between values obtained for fiber reinforced mortar (FRM) and mortar of the same features without fiber reinforcement.

These studies allowed to obtaining load/strain curves and stress/strain curves which were used to determine specific elastic modulus, toughness and toughness indices for selected samples.

Finally, the study in deep on the recovery of plastic waste from post-consumer packages was developed, particularly polyethylene terephthalate fibers (PET), which were used as reinforcement in mortars cement matrix.

The characterization of PET fibers was completed, specially on their durability behaviour and the development of simple production procedures; the following sizes of fibers were prepared: $1 \times 18 \text{ mm}^2$ fibers from shear cutting, and $4 \times 18 \text{ mm}^2$, $4 \times 35 \text{ mm}^2$ and $4 \times 50 \text{ mm}^2$ from documents shredder cutting.

Cement based laminar samples were prepared using these fibers, that were tested by 3 and 4 points bending procedures. These studies permit to obtain load/strain and stress/strain specific curves which were used for determining mechanical strength and flexural elastic modulus, toughness and impact resistance for selected samples.

The results show that these fibers can be a good choice for reinforcing, especially interesting to FRM production in developing countries. It would be necessary to adapt its production procedure depending on the selected construction elements.