



“Gheorghe Asachi” Technical University of Iasi, Romania



CHEMICAL, MECHANICAL AND THERMAL PROPERTIES OF MORTAR COMPOSITES CONTAINING WASTE PET

Ahmed Soufiane Benosman^{1,2,3*}, Mohamed Mouli², Hamed Taibi¹, Mohamed Belbachir¹,
Yassine Senhadji², Ilies Bahlouli¹, David Houivet⁴

¹Faculty of Exact Sciences and Applied, Laboratory of Polymer Chemistry, University of Oran 1, Ahmed Benbella. BP 1524, El Mnaouer, Oran 31000; Algeria

²Department of Civil Engineering, Laboratory of Materials, ENPO, Maurice Audin, BP. 1523, El Mnaouer, Oran 31000, Algeria

³Department of Chemistry, Superior School of Applied Sciences, ESSAT, Tlemcen, Algeria

⁴University of Caen Basse-Normandie, Laboratory of LUSAC EA 2607, BP 78 – 50130 Cherbourg Octeville, France

Abstract

The main objective of this study was to investigate the potential utilization of polyethylene terephthalate PET waste in cementitious matrix, as substituent to cement, to develop lightweight construction materials and for preventing chemical attacks or repairing various reinforced concrete structures. Composites containing different amounts of PET particles, as partial replacement to cement by weight, were characterized by destructive and non-destructive testing. So, the thermal conductivity, ultrasonic pulse velocity (UPV) and sorptivity coefficients of composite made up of mixtures of PET polymer were measured; the adverse environmental conditions are simulated by using various acid solutions. The corrosion process was monitored by measuring the mass loss and compressive strength for different periods. The experimental investigation revealed that the addition of PET particles reduces the UPV; furthermore, thermal conductivity and sorptivity of the composites have been decreased. So, the decrease of the sorptivity-value is favorable to the durability of the specimen structures. On behalf of the resistance to aggressive environments, it was found that the course of action of acid attack is dependent on the type of acid and solubility of the calcium salt formed. The presence of PET was found to lower the detrimental effect of acids on composite. Scanning electron microscope (SEM), X-ray diffraction and FT-IR analyses were used to better understand the cement hydration products of the deteriorated mortars. In this way, the obtained PET-mortar composites would appear to be low-cost materials which would contribute to resolving some of the solid waste problems in addition to conserving energy.

Key words: Acid, Composite, FT-IR, PET waste, SEM, Thermal conductivity, UPV, XRD

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* Author to whom all correspondence should be addressed: e-mail: amre20022000@yahoo.fr; Phone: +213 794 60 01 07