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Accelerated aging of waste-based polymer composites with inorganic fillers

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This study aimed to investigate the properties of composites based on polymeric waste with inorganic filler and the modification of the material's structure during the ageing process. Novel composite materials were developed by compression moulding using waste: tire rubber as matrix and plastic materials (polyethene terephthalate - PET, high density polyethene - HDPE) as the reinforcing organic and inorganic materials filler (CaO, ZnO nanoparticles). The critical issue in ensuring good mechanical properties is the interface between the components of the composites. The effects of moisture, elevated temperature, UV radiation, and salt fog on the mechanical properties of composites were evaluated. An attempt was made to correlate the changes in the mechanical properties with the changes in the chemical compositions and microstructure of the composite materials. These were determined by FTIR analysis, contact angle measurements, SEM analysis and X-ray diffraction (XRD). To evaluate the durability performance of waste composites in this study, unconditioned and conditioned specimens were tested for tensile strength, compression, and impact. The changes in those properties are considered indicators of durability performance. The mechanical properties of the composites of the polymer composites with organic filler material depend on the interface between rubber and PET, the production temperature, on the characteristics of the operating environment. Thus, the moisture absorbed by the composite materials leads to a significant decrease in the values of the elasticity modules; the importance of elongation at the break of the samples improves significantly with the increase in the temperature of obtaining the samples; the interactions between the polymer and the inorganic filler materials have the effect of increasing the energy of molecular cohesion and implicitly the thermal energy required to activate the thermal degradation mechanism.

Biography

Cristina Cazan has experience of over 18 years in the field of solid waste management, circular economy, recycling, environmental management and audit, and waste recycling technologies. Her activities focus on developing novel, advanced materials with controlled properties, supporting sustainability, and developing novel tailored materials fully entirely on waste as raw materials, optimized for indoor and outdoor applications. The research focuses on novel composites based on scraps, and her contributions cover composites design, synthesis and characterization, and materials testing and optimization xtowards specific applications.

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