# EFFECT OF PCL/HEC POLYMER BLEND COMPOSITION ON DEGRADATION MECHANISMS UNDER DIFFERENT CONDITIONS

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This study investigates the degradation of polymer blends based on poly(ε-caprolactone) (PCL) and hydroxyethyl cellulose (HEC), prepared with varying amounts of filler (HEC), plasticizer (glycerol), and compatibilizer (ethylene-co-acrylic acid, EAA). The filler content ranged from 0 to 50 wt.%. The effect of individual components on the structural properties and morphology of the blends was analyzed before and after exposure to degradation conditions. Degradation was examined using two methods: the soil burial test, simulating microbial degradation in a soil environment, and accelerated photochemical degradation in a QUV chamber. FTIR spectroscopy and SEM analysis were used to identify chemical and morphological changes. The results showed significant differences in degradation behavior depending on the blend composition, with the highest degradation observed in samples with higher HEC and plasticizer content. The soil burial test and QUV exposure indicate distinct degradation mechanisms depending on the environment. These findings contribute to a better understanding of biodegradable polymeric systems and their optimization for various applications.

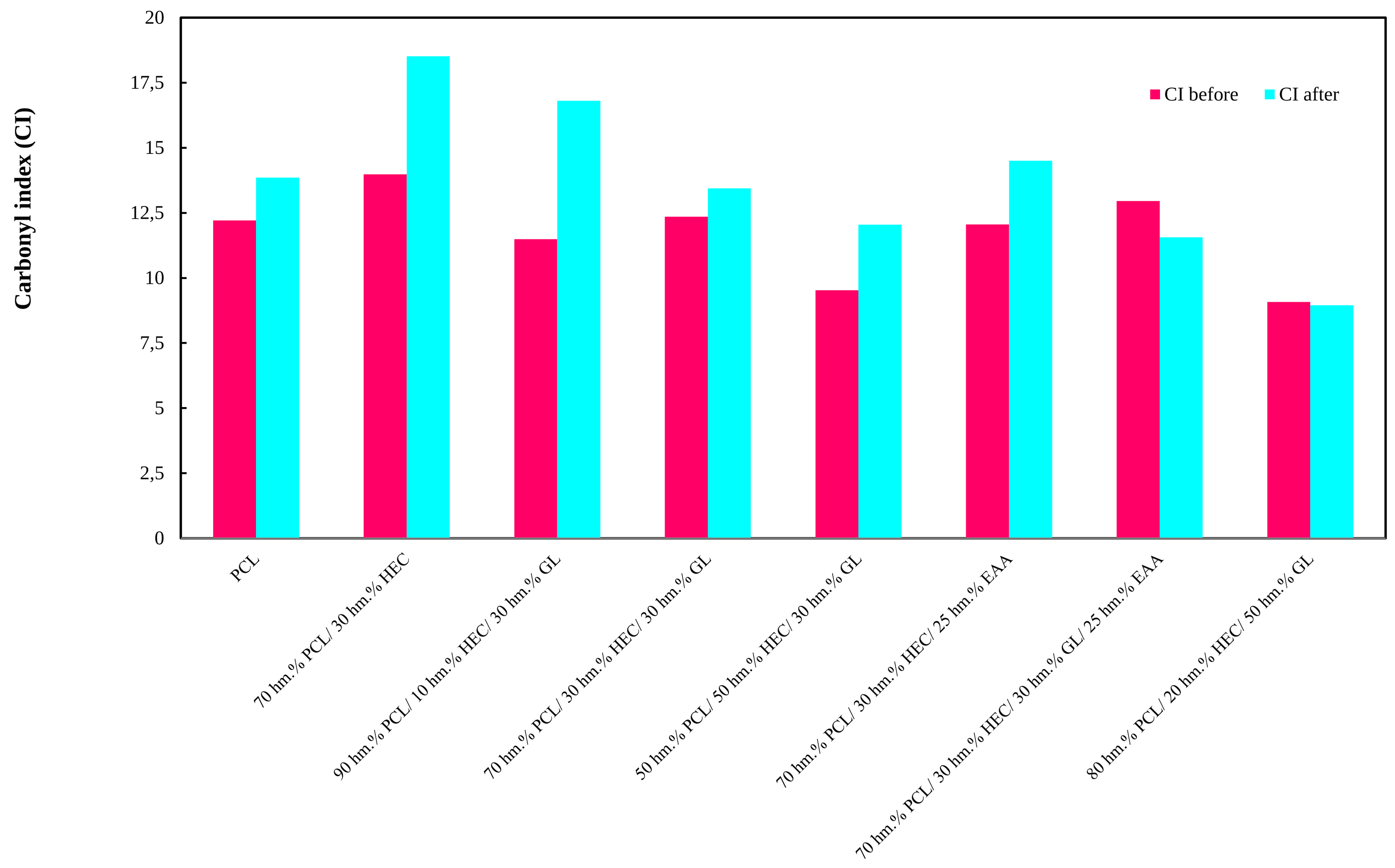


**Fig. 1** Comparison of the carbonyl index (CI) of PCL/HEC blends with varying composition before and after QUV degradation

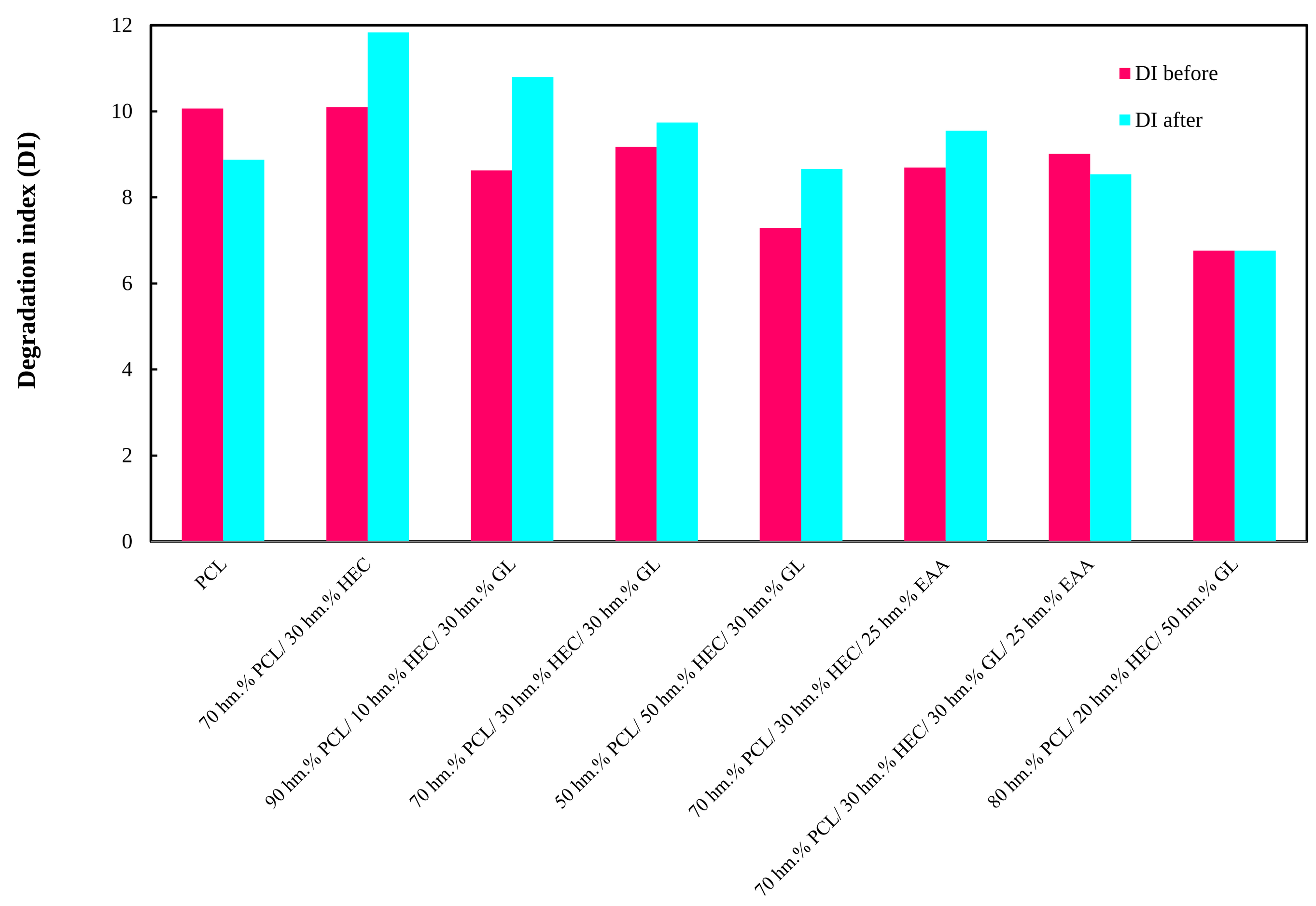


**Fig. 2** Comparison of the degradation index (DI) of PCL/HEC blends before and after QUV degradation

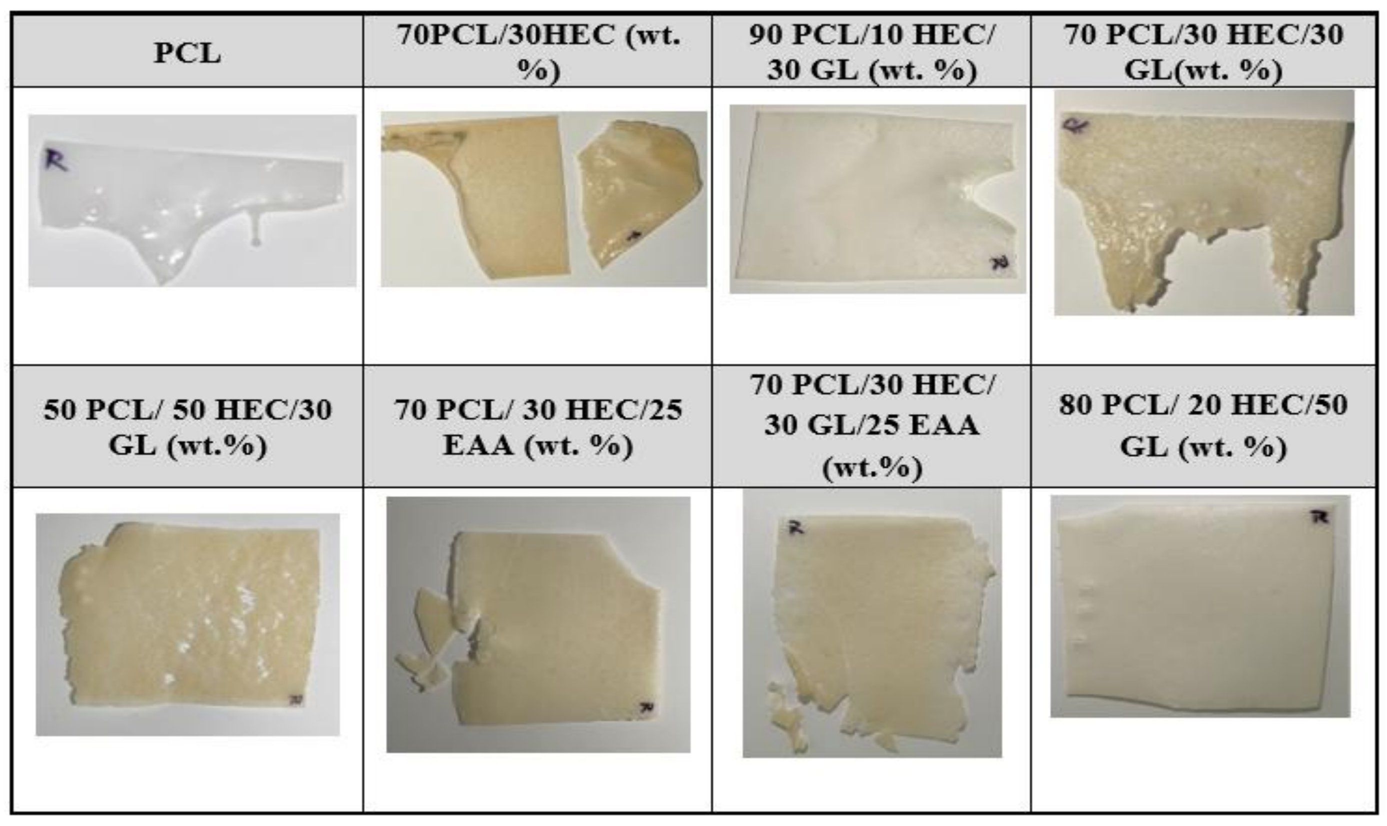


**Fig. 4** Comparison of the appearance of PCL/HEC blends after QUV degradation as a function of glycerol and EAA compatibilizer content

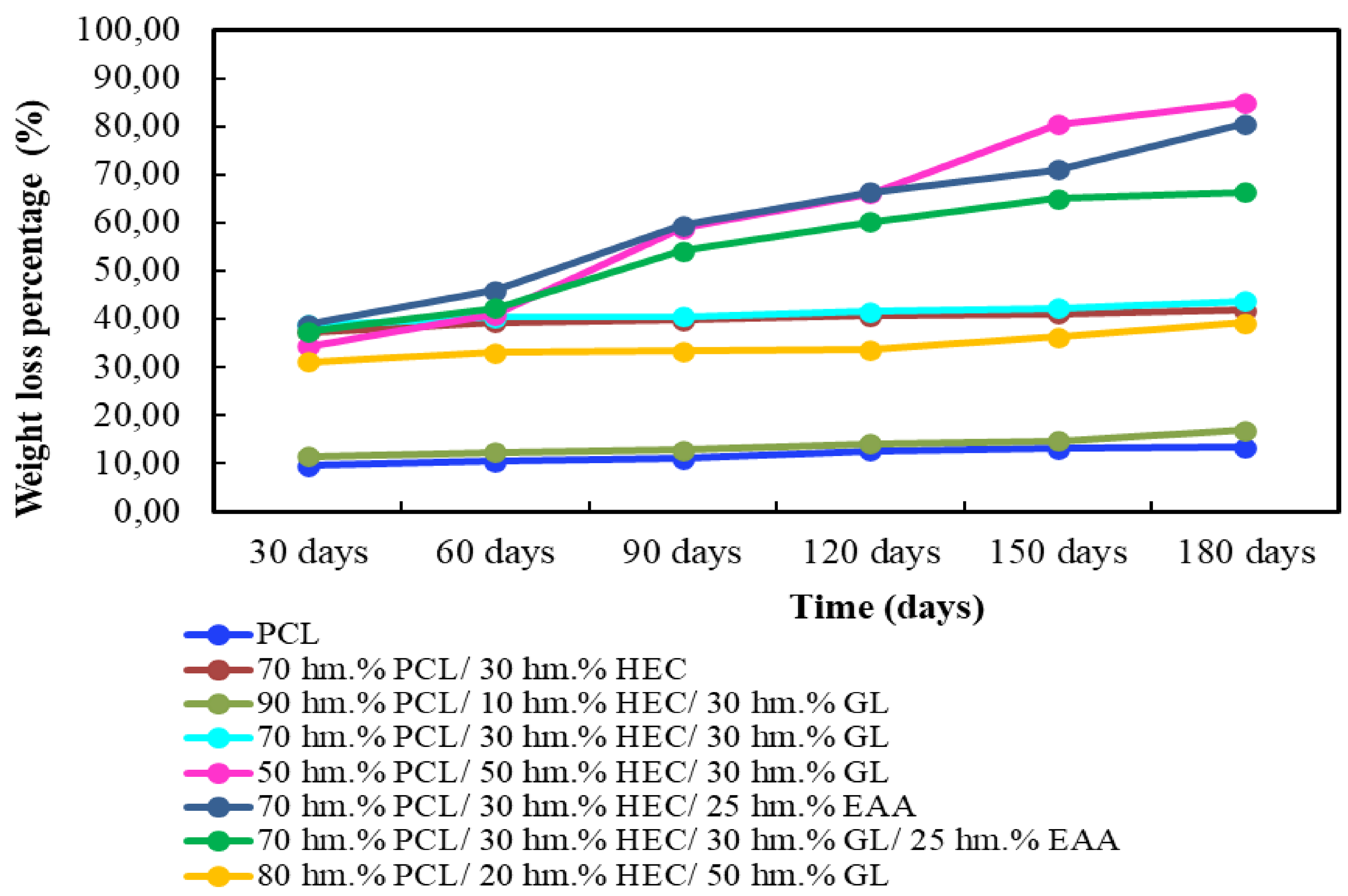


**Fig. 5** Weight loss of PCL/HEC blends during the soil test at 30-day time intervals

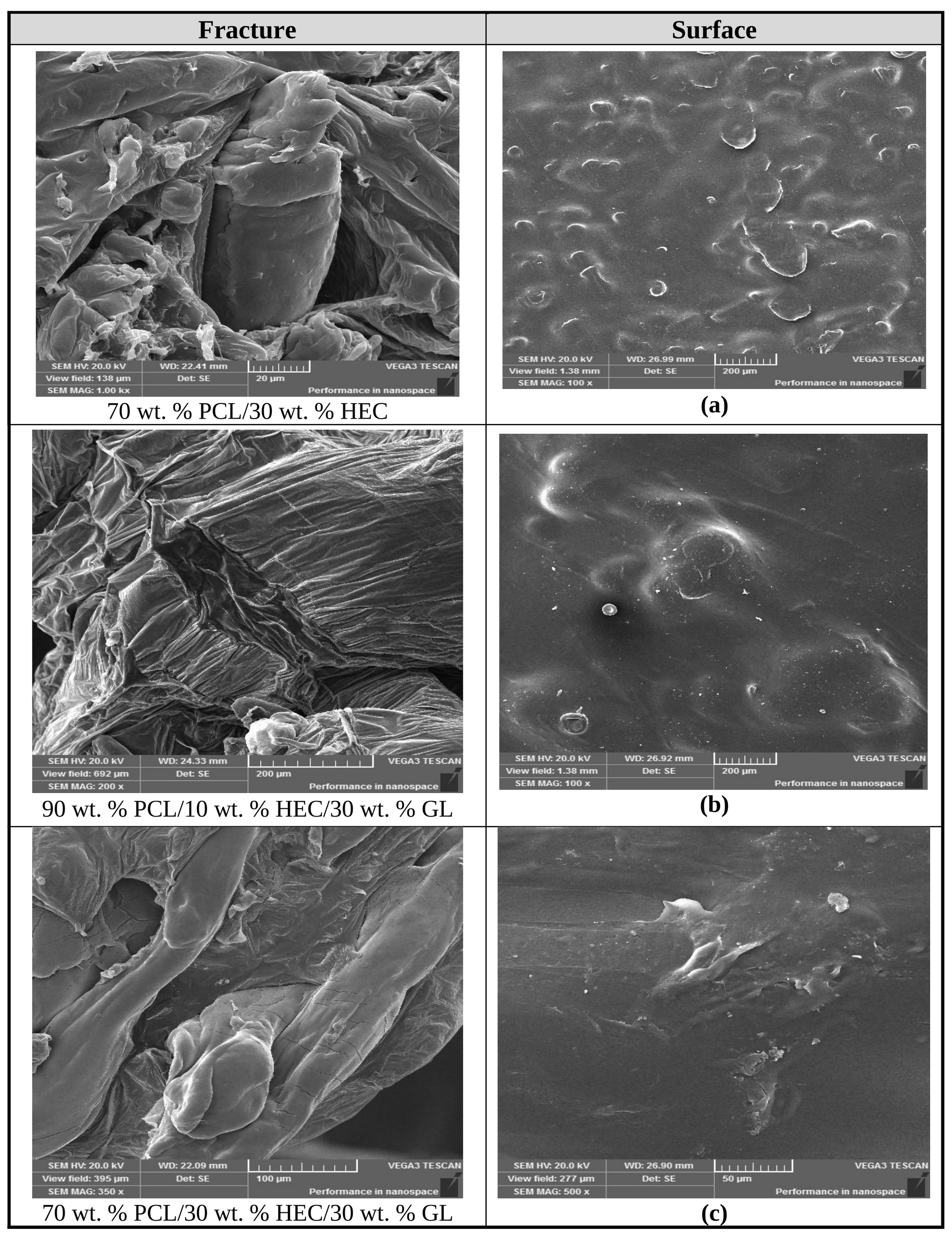


**Fig. 3** SEM images of PCL/HEC blends with varying HEC and glycerol content without EAA presence after QUV degradation

## Conclusion & Key Findings

- The degradation behavior of PCL/HEC blends was studied under QUV and soil burial conditions.
- **Photooxidation (QUV)** led to surface damage, while **soil degradation** caused severe microstructural breakdown.
- **EAA** improved thermal stability and structure retention during QUV exposure, but not in soil.
- **Blends with high HEC and glycerol content** degraded rapidly, confirming their strong biodegradability.
- Additive composition significantly influences the **thermal, morphological**, and **degradation profiles** of the blends.
- Optimizing formulation enables tailoring material properties for specific applications, especially in **biomedical** and **packaging** fields.

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