

MICRONISED POLYETHYLENE TEREPHTHALATE (MPET) AS A CIRCULAR ECONOMY SOLUTION FOR SUSTAINABLE PAVEMENT ENGINEERING

ABSTRACT Global plastic production has exceeded 400 million metric tons annually, with Polyethylene Terephthalate (PET) representing one of the most significant waste streams due to its widespread use in packaging. Conventional disposal practices highlight the urgent need for circular economy solutions that repurpose waste into valuable resources. This paper explores the application of micronised PET (MPET) as a sustainable filler in asphalt pavement. Through micronisation, PET's high melting point challenge is mitigated, enabling effective integration at standard asphalt mixing temperatures. Laboratory findings demonstrate that MPET enhances key pavement properties, including resilient modulus, indirect tensile strength, adhesion, and moisture resistance, with optimal performance achieved at a 12% filler replacement rate. Beyond technical improvements, the use of MPET supports circular economy imperatives by diverting plastic waste from landfills, reducing dependence on virgin materials, and extending pavement service life. MPET thus presents a scalable approach to improve infrastructure resilience and address the global plastic crisis simultaneously.

This research underscores MPET's potential to advance resilient and sustainable transport infrastructure. By demonstrating a practical pathway for integrating recycled plastics into asphalt, the study supports circular economy principles while addressing engineering requirements for longer-lasting roads. Consequently, MPET emerges as a viable alternative filler for local road construction, aligning environmental responsibility with superior pavement performance.