RESEARCH ON POLYOXYMETHYLENE-FIBER-REINFORCED CONCRETE TO RESIST BLAST LOADING

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ABSTRACT

Polyoxymethylene (POM) is distinguished among contemporary polymers for its exceptional mechanical robustness and longevity. Its ability to seamlessly integrate with cement paste, especially when utilized in fiber form, has sparked considerable interest within the construction materials domain. As an innovative material, POM-Fiber-Reinforced Concrete demonstrates significant potential in enhancing the dynamic resistance of civil engineering structures subjected to extreme loads such as blasts, shocks, and impacts. The objective of this study is to explore the benefits of POM-Fiber-Reinforced Concrete when subjected to blast loading, along with identifying a suitable Finite Element Analysis (FEA) method for simulating its resistance to such loading conditions. Initially, the LS-DYNA software is employed, utilizing the modified K&C (MAT_72R3) concrete material model, to simulate the performance of POM-Fiber-Reinforced Concrete walls under close-in explosion scenarios. Subsequently, the proposed modified K&C (MAT_72R3) concrete material model is validated through blast tests to ensure its accuracy and reliability. The findings suggest that POM-Fiber-Reinforced Concrete walls sustain significantly less damage under close-in explosion conditions compared to Normal Strength Concrete walls. Moreover, the calibrated K&C concrete material model demonstrates its capability to accurately capture the dynamic response of POM-Fiber-Reinforced Concrete when subjected to blast loading.