

Impact of Fly Ash-Based Geopolymer Modification on the High-Temperature Properties of Bitumen

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Abstract : This study evaluated the mechanical and rheological performance of fly ash-based geopolymer at high temperatures. A series of laboratory tests were conducted on neat bitumen and three modified bitumen samples, which incorporated fly ash-based geopolymer at various percentages. Low-calcium fly ash was used as the alumina-silica source. The dynamic shear rheometer and rotational viscometer were employed to determine high-temperature properties, while conventional tests such as penetration and softening point were used to evaluate the physical properties of bitumen. The short-term aging resistance of the samples was assessed using the rolling thin film oven. The results show that geopolymer has a compromising effect on bitumen properties, with improved stiffness, enhanced mechanical strength, and increased thermal susceptibility of the asphalt binder.

Keywords : bitumen, geopolymer, modification, dynamic mechanical analysis

Conference Title : ICPEAD 2023 : International Conference on Pavement Engineering, Analysis and Design

Conference Location : Singapore, Singapore

Conference Dates : July 03-04, 2023