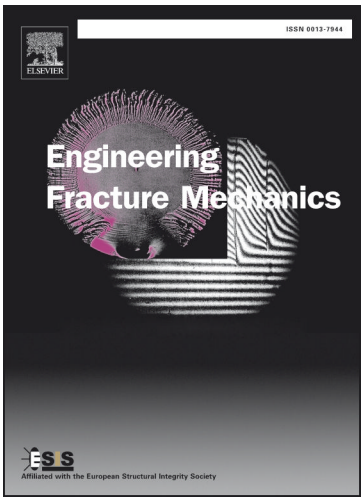

Mixed mode tensile - in plane shear fracture energy determination for hot mix asphalt mixtures under intermediate temperature conditions

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Mixed mode tensile - in plane shear fracture energy determination for hot mix asphalt mixtures under intermediate temperature conditions

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A b s t r a c t

One of the major issues of hot mix asphalt (HMA) concretes in moderate service temperatures is cracking, which may result in asphalt failure. Although several studies conducted have focused on the cracking of HMA, there are only few studies that focused on the viscoelasticity of this mixture. This paper investigated the effect of viscoelastic asphalt characteristic on mixed mode I/II fracture resistance. Various loading rates were applied on the specimens in the moderate service temperature to experiment the implications. Edge cracked semi-circular bend (SCB) of various HMA specimens subjected to asymmetric three-point bend loading were tested in this study. Effect of aggregate type, bitumen type and air void content were studied on the fracture energy for pure mode I, pure mode II and mixed mode I/II with equal fraction of modes I and II. The results showed that the variables can significantly affect HMA characteristic specifications on moderate temperature cracking behavior. It was observed that the performance grade (PG) of bitumen, aggregate type and air void content had considerable effect on the fracture energies of the tested specimens at moderate temperatures. Test results also enlightened that mixed mode loading case was more crucial than the pure modes I and II conditions of loading.

Keywords: Asphalt mixtures, Fracture Energy, Air void effect, Intermediate temperature effect, Critical fracture mode, Mixed mode I/II loading.

Nomenclature

a	Notch length
A_{lig}	Ligament area
G_f	Fracture energy
G_{If}	Mode I fracture energy
G_{IIf}	Mode II fracture energy
$G_{I/IIf}$	Mix mode I/II fracture energy
K_I	Mode I stress intensity factor
K_{II}	Mode II stress intensity factor
M^e	Mode mixity parameter
P	Applied load