

Abstract

This study investigated the crack healing performance of multiple scales of AC-13 asphalt mixtures treated with two maltene based cationic emulsions and base bitumen emulsion. Crack healing tests on bitumen and mastic subscales were conducted following a tensile fracture-healing-refracture test. Mortar and mixtures healing tests were conducted using a semicircular bending test. The impact of healing time, moisture ingress, aging and variations in healing temperature on crack healing of the treated asphalt materials was investigated. Test results indicated that self-healing of aged asphalt materials is significant at bitumen and mastic subscales and negligible at mortar and mixtures scales. Upscaling from bitumen to mixtures has a serious negative effect on healing. The healing trend of mortar had a strong correlation with healing of mixtures. Therefore, the mortar subscale could accurately screen healing of asphalt mixtures. After long time healing of long-term aged asphalt mixtures treated with HAs, up to 65% of initial peak strength and 55% of fracture energy was recovered. Maltene based cationic emulsions induced better healing than base bitumen emulsion. Asphalt material scale and test design parameters have a significant effect on healing. Therefore, a judicious selection of the appropriate combination of these variables is important in a healing test design.