Experimental Reproduction and Generation Conditions of Wheel Tread Thermal Cracks

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Focusing on the durability of carbon steel railway wheels, so-called tread thermal cracks, one of severe damages on the tread surface, were investigated to understand the cracks generation processes involving initiation and propagation. We have demonstrated that tread thermal cracks can be experimentally reproduced under the condition of concurrent effect of continuous rolling contact with rails and cyclic frictional heat from brake blocks, through the experiments using an actual railway wheel. Relations among residual stress, cracks configuration and fracture surface were examined to study the crack generation process. It was revealed that plastic deformation and thermal stress near the surface resulted in substantial tensile residual stress, which caused the generation of cracks.