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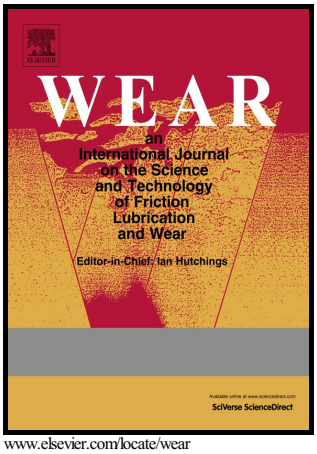

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Surface crack formation on rails at grinding induced martensite white etching layers

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Abstract

The connection between profile grinding of rails, martensite surface layers and crack initiation has been investigated using visual inspection, optical microscopy and 3D X-ray computerized tomography. Newly grinded rails were extracted and found to be covered by a continuous surface layer of martensite with varying thickness formed by the grinding process. Worn R350HT and R200 rails were extracted from the Danish rail network as they had transverse bands resembling grinding marks on the running surface. The transverse bands were shown to consist of martensite which had extensive crack formation at the martensite/pearlite interface. The cracks in R350HT propagated down into the rail while those in the soft R200 returned to the surface causing only very small shallow spallation. The transverse bands had the same shape, size, orientation, location and periodicity which would be expected from grinding marks, showing a clear connection between grinding and crack initiation.

Keywords: Grinding; Railway; Steel; Martensite

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