

## Fretting crevice corrosion of the upper surface of the rail foot

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**Abstract** Fretting crevice corrosion is a synergistic combination of fretting and crevice corrosion. There are obvious and subtle differences among fretting crevice corrosion, tribocorrosion, fretting corrosion and mechanically assisted crevice corrosion<sup>[1]</sup>. Fretting crevice corrosion is characterized by small scale of reciprocating motion and big contact surface area<sup>[1]</sup>. The upper surface of the rail foot, covered by the liner of the fastening system, is a typical circumstance for fretting crevice corrosion. When a train passes by, vibration of very small amplitude is induced. If the environment is humid with salt, fretting crevice corrosion may take place<sup>[2]</sup>. A novel testing apparatus was developed in this study to simulate the fretting crevice corrosion between the rail foot and the liner, and a typical rail steel (U75V) and a typical material for the liner (PA66) have been utilized. The electrochemical behaviors and morphology of the contact surface have been investigated. The OCP and anodic current were both increased with increasing fretting frequency and displacement amplitude. The presence of PA66 debris in the form of large spalling particles has been found to inhibit crevice corrosion and relieve the surface damage to some extent. Cracks and local surface collapse were typically noticed on U75V steel which have been ascribed to the accumulation of plastic deformation and the comprehensive effect of fretting wear and corrosion fatigue<sup>[3]</sup>.

**Keywords** fretting, crevice corrosion, U75V steel, rail track, wear

### Reference

[1] Weichen Xu et al., Corrosion Communications, 11 (2023) 23-32.

[2] Weichen Xu et al., Corrosion Reviews, 39 (2021) 1-13.

[3] Zexian Wang et al., Journal of Materials Research and Technology, 30 (2024) 4228-4240.