In this paper, a high temperature pin-on-disc configuration was used to simulate the contact established between a high-speed steel (HSS) work roll and a hot strip material in hot rolling, in which the pin represented the HSS roll and the disc represented a strip steel. The pin surfaces were oxidised due to the heat transfer from the disc while they were in contact. This work focused on the contact behaviour of the oxide scale in the roll bite during hot rolling while the testing temperature was close to the rolling temperature, the Hertzian pressure was similar to the contact pressure and the sliding speed were close to those in the roll bite. The coefficient of friction during the tests was monitored and recorded in-situ. It was found that the evolution of the coefficient of friction could be divided into three stages. Associated with the evolution of the coefficient of friction, the morphologies and micro-structures on the surface of pin were characterised by means of SEM, FIB and TEM techniques to study the tribological behaviour of oxide scale in contacts. The results indicated that the wear mechanism of pin surface varies in different stages. At the stages I and II, the oxide scale on the pin surface is significantly deformed. At the Stage III, which the coefficient of friction is stable, the wear mechanism is a mixture of adhesion, abrasion and oxidation. The oxide transfer from the mild carbon steel disc to HSS pin significantly contributed to the scale formed on the HSS pin surface.

Keywords: oxide scale, pin-on-disc, hot rolling, tribology