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The effect of surface texture on the oxidation behaviour of polycrystalline Fe-Cr

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Abstract

Grain-direction dependent oxidation at the surface of polycrystalline Fe-Cr steel is not well understood, as most of the described systems in literature focus on single crystals of either Fe or Cr. We found through electron backscatter diffraction that surface oxidation in air at temperatures between 260 – 450 °C depends severely on grain orientations at the outer surface. Subsequently electron microscopy was combined with X-ray photoelectron spectroscopy (XPS) and X-ray Diffraction (XRD) to characterize the oxide film further in detail. In particular we have observed the following sequence in oxidation rate of crystal planes parallel to the surface for Fe-Cr steel, $\{001\} < \{111\}$ & $\{101\}$, which was not reported in literature before.

Keywords: Steel, Iron, Chromium, XRD, Atmospheric Corrosion, EBSD

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