

Influence of Grain Shape, Size and Grain Boundary Diffusion on High Temperature Oxidation of Metal

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Abstract : Influence of grain size, shape and grain boundary diffusion at high temperature oxidation of pure metal is investigated as the function of microstructure evolution in this article. The oxidized scale depends on the geometrical parameter of the metal-scale system and grain shape, size, diffusion through boundary layers and influence of the contamination. The creation of the inner layer and the morphological structure develops from the internal stress generated during the growth of the scale. The oxidation rate depends on the cation and anion mobile transport of the metal in the inward and outward direction of the diffusion layer. Oxidation rate decreases with decreasing the grain size of the pure metal, whereas zinc deviates from this principle. A strong correlation between the surface roughness evolution, grain size, crystalline properties and oxidation mechanism of the oxidized metal was established.

Keywords : high temperature oxidation, pure metals, grain size, shape and grain boundary

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