ACTA METALLURGICA SINICA (ENGLISH EDITION)
Series B, Vol.6 No.2 pp 147-150 Apr 1993

HIGH TEMPERATURE OXIDATION AND STRUCTURE OF SCALE AND WHISKERS FOR Fe-Ni-Cr SEALING ALLOYS

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[Originally published in ACTA METALL SIN (CHINESE EDN) 28(10) 1992 pp B449-B452, received 3 June, 1991]

The oxidation rate, the growth, morphology and structure of oxide scale and whiskers for Fe-Ni-Cr *sealing alloys in* H_2-H_2O *atmosphere at high temperatures have been studied. The growth rate of scale is controlled by diffusion. The scale is composed of* Cr_2O_3 *and spinel* (Fe, Mn)O·Cr_2O_3 and the oxide whisker, are spinel (Fe, Mn)O·Cr_2O_3.

KEY WORDS *oxidation, oxide scale, oxide whisker,* Fe-Ni-Cr *sealing alloy*

The expansion coefficients of Fe-Ni-Cr sealing alloys are in accord with those of galsses. In certain atmospheres and at certain temperatures, uniform oxide scales will form on the surfaces of the alloys. The oxide scale and glass are soluble to each other at elevated temperatures, thus the alloy and glass can be sealed. The structure of oxide scales influences the quality of metal-glass sealing.

The composition and structure of oxide scales relate to the compositions of alloys and the oxidation process. The high temperature oxidation behavior of Fe-42Ni-6Cr sealing alloys were well studied in the past [1, 2]. In recent years, Ma *et al.* [3] tried to illusitrate the formation mechanism and composition of oxide whiskers in Fe-47Ni-6Cr alloys. The influneces of surface conditions and oxidation conditions on formation of oxide whiskers were also investigated. In present parper, the oxidation behavior and oxide scales of Fe-47Ni-6Cr alloys are studied further. The structure and composition of oxide scales and oxide whiskers are examined while the oxidation kinetics are investigated.

1. Materials and experimental procedure

The chemical compositions of Fe-Ni-Cr alloys are shown in Table 1. The alloys were rolled, cut into specimens and annealed in vacuum. The surfaces of the specimens were cleaned. The specimens were oxidized at very low partial pressures of oxygen. Then the oxidation and the weight gains of the specimens were measured. Oxide sacales and whiskers were examined on D/Max-RB X-ray diffractometer, S-450 scanning electron microscope and H-800 transmission electron microscope.

Table 1 Chemical composition of Fe-Ni-Cr alloys, wt-%

Code	Ni	Cr	Si	Mn	Al	S	Zr	Hf	Fe
A	46.89	6.06	mini	trace	mini	trace	—	—	bal.
B	47.70	6.20	trace	trace	trace	trace	—	trace	bal.
C	47.22	6.22	mini	trace	mini	trace	trace	trace	bal.
D	41.90	5.80	mini	trace	mini	trace	—	—	bal.