The roles of Ni segregation on the oxidation kinetics of austenitic steel 316L exposed to oxygen-containing liquid Pb-Bi eutectic

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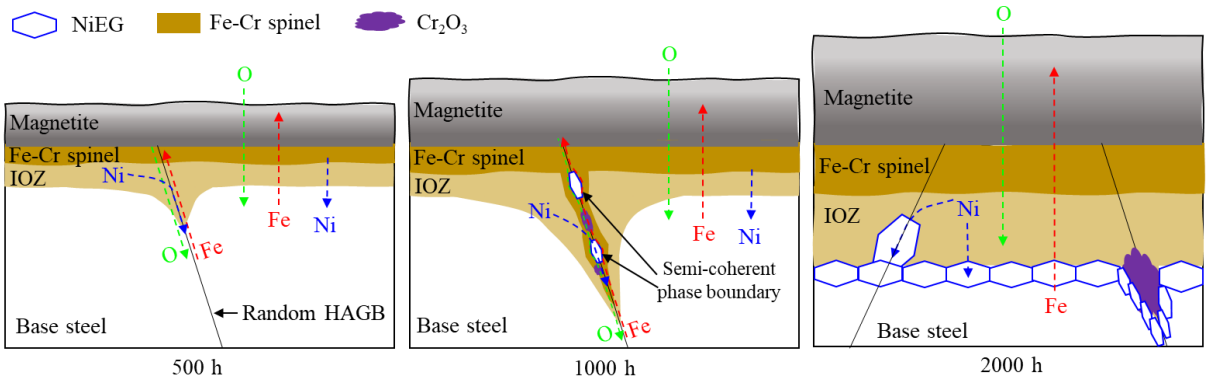
Abstract The micro-to-atomic structure of the oxide scale formed on 316L steel exposed to oxygen-containing liquid Pb-Bi eutectic at 550°C is characterized by SEM-EDS, EBSD, FIB-TEM and synchrotron radiation micro-XRD. Nickel that was believed to be detrimental to steel corrosion in Pb-Bi is revealed to be beneficial on retarding the oxidation kinetics. Ni does not oxidize and exists as metallic Ni-rich nanophase in the internal oxidation zone (IOZ). The inward diffusion of Ni from IOZ to the steel base causes the segregation of coarse Ni-rich precipitates on grain boundaries and the steel/IOZ interface, which hinders both the intergranular and trans-granular diffusion.



Schematics illustrating the roles of nonreactive Ni on the oxidation kinetics of austenitic 316L in oxygen-containing liquid LBE.

Keywords Austenitic steel; TEM; EBSD; Liquid metal corrosion; Oxidation.