CORROSION OF SILICON CARBIDE FILTER IN MOLTEN METAL

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Due to its non-wetting behavior, and excellent resistance to corrosion and thermal shock, corrugated silicon carbide filter is suitable for filtering molten metal. This paper illustrated that the corrosion process of silicon carbide by molten copper could be divided into 4 stages; i.e. non-wetting adsorption of molten metal, wetting absorption on glassy surface, carbon precipitation and bubble formation, and crystallization. As soon as the molten metal contacted the silicon carbide surface, oxidation of silicon carbide into silica occurred. The wetting angle of the molten metal gradually became flattened as the glassy phase progressively penetrated into the silicon carbide matrix. If the contact time is prolonged, carbon precipitation was observed. Then oxidation of the carbon would give rise to carbon-monoxide gas bubbles. Finally, alkali impurities from clay binder would react with the glassy phase, followed by crystallization of silicate products. It was observed that the filter could be used reliably before crystallization started, otherwise some impurities or broken bits may be unacceptably added into the molten metal.

(a)

(b)

(c)

Figure 1. Corrosion on silicon carbide filter illustrating (a) non-wetting adsorption of molten metal, (b) wetting absorption on glassy surface, and (c) corrosion reaction.