Testing method for Morphology and Position of Solidification Front in Casting Process of Aluminum Alloy

Technical Field

The present disclosure relates to the technical field of aluminum alloy casting, and in particular, to testing method for morphology and position of solidification front in casting process of aluminum alloy.

Background

At present, aluminum alloy flat ingots and round ingots for extrusion and rolling deformation are mostly produced by direct water-cooled semi-continuous casting. The main feature of this process is that a liquid metal melt passes through a crystallizer continuously, and solidification and constrained forming of the metal are achieved by means of the crystallizer. In the production process of this process, a liquid metal area on an upper part of the ingot surrounded by a crystallization front and an exposed liquid surface of the ingot is referred to as liquid cavities (i.e., the solidification front). The shape of the liquid cavities of the ingot determines the changes in the metal crystallization speed of the cross section of the ingot, and the depth of the liquid cavities directly reflects the solidification time and solidification speed in the ingot preparation process. Therefore, accurately measuring and adjusting the morphology and position of the solidification front in the casting process is an important indicator and means to reflect and control the quality of the ingot.

The commonly used method for measuring the morphology and position of the solidification front is a point insertion method, that is, in the casting process, a thin wire or probe is inserted vertically from the metal liquid surface into the melt until a solid phase is touched, and then is drawn out. The position of the solidification front in the casting process is measured by measuring the length of the inserted wire or probe at different positions. Although this method is simple and feasible, the measuring accuracy is affected by the experience of an operator and the perpendicularity of the probe, which results in a relatively large error and incapability of accurately reflecting the changes in the position of the solidification front. If the casting condition or process changes, an error value is relatively larger. In order to compensate for the error caused by the wire insertion method, a