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DISSERTATION SUMMARY

The dissertation raises the issue significant from the perspective of steel manufacturing related to removing non-metallic inclusions (NMIs) from liquid steel, which is reflected in its better strength properties. The steel-making practice applies spontaneous methods of NMIs removal (gravitational method), and argon blowing of liquid steel is broadly used. However, due to consistently raising recipients' requirements regarding steel quality that is currently determined first of all by quantity and size of NMIs included in steel, other additional methods of liquid steel purification are still sought for. One proposal to intensify the removal of liquid steel inclusions is a filtration process through multiple-hole ceramic filters. Adequate laboratory tests were conducted in order to determine the efficiency of NMIs removal from liquid steel through the filtration process. The melting processes were carried out from the high carbon steel, grade C70, while the sedimentary deoxidation process was carried out at a particular temperature and amount of deoxidant. The steel was first poured through a single filter, and afterwards through a set of filters: a double and triple filter system. When the process was completed, the research material underwent qualitative and quantitative tests.

The qualitative tests covered observation of the separation boundary between filter ceramics and solidified steel by means of a scanning microscope. They intended to identify the non-metallic inclusions resulting from the sedimentary deoxidation process with aluminum. In addition to that, there was a simulation performed in FactSage in order to determine the probable type and amount of generating non-metallic phases. The simulation adopted various conditions of access and amount of oxygen along with various contents of deoxidant. The probable chemical composition of the non-metallic phase due to liquid steel-deoxidant interaction in the state of thermodynamic equilibrium was determined. Afterwards, there were the X-ray diffraction tests carried out on the border between ceramic filter and solidified steel, which were intended to confirm the release of aluminum compounds as non-metallic inclusions.

There were the quantitative tests carried out in order to determine the filtration degree of particular filtration systems by means of an optical microscope, which served for

determination of a number of non-metallic inclusions identified in the sample before and after filtration. The tests were carried out on steel samples before they were poured through the filter and right after the filtration process, in order to determine the chemical composition of the sample before and after the filtration process. The obtained results allowed to identify the filtration efficiency for non-metallic inclusions and to perform the comparative analysis of efficiency for various sets of filters.

Agnes B.