Carnegie Mellon
Materials Science and Engineering Seminar Series
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Wanlin Wang
Graduate Research Assistant
Department of Materials Science and Engineering
Carnegie Mellon University

"The Heat Transfer Phenomenon Across Mold Flux to Copper Mold in Continuous Casting"

Friday, March 31st, 2005
11:00 A.M. Seminar in Baker Hall 136A
Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

In the development of steel technology, continuous casting has become the main process route for mass production of steel today. 600 million tons of steel was cast annually corresponding to 80% of the total steel production in the world. Like any other new process, continuous casting is efficient. However, it also introduces new types of defects, like oscillation marks, corner cracks, facial cracks, macro inclusions, etc. Currently, a wealth of experience in industry has been developed to improve slab surface qualities. Most of the research has indicated that the final cast slab surface is strongly dependent upon the heat release rate from the steel strand, i.e., heat transfer from rate from the partially solidified strand to copper mold.

A mold flux has been widely used to infiltrate in between the copper mold and strand to moderate the heat transfer rate. The main goal of this study is to explore the effects of mold flux composition and solidification on heat transfer rates, especially on radiative heat transfer rates.

It has been shown in the work that both the solid crystalline and glass phase films have different thermal resistance and affect the radiative heat transfer rate. The crystallization behavior of the mold flux is the primary factor affecting the overall heat transfer rate. By using an infrared radiation emitter, which was developed at Carnegie Mellon University, a radiative heat flux was applied to a copper mold covered with solid mold flux disk to simulate the radiative heat transfer phenomena in continuous casting. The solid slag disc could either be glass or a mixture of glass and precipitated crystals. The kinetics of mold slag crystallization was studied by the recently developed double hot thermocouple techniques (DHTT) as well. It has been investigated that the effect of full crystallization of a slag disk was to reduce the heat transfer rate by 20.5% in this work.

Wanlin Wang received his Bachelor degree in Metallurgical Engineering from Central South University, China in 2000. He received his MS in Materials Science and Engineering from Carnegie Mellon University in Dec. 2004. He is currently a graduate research assistant working towards his Ph.D. project under the guidance of Prof. Alan W Cramb.