1.
Introduction

The decarburization phenomenon in steelmaking has been extensively studied because it influences directly the productivity and the conversion costs. Former researchers proposed a few mechanisms purely developed on theoretical basis, and only some of them were supported by data collected from traditional basic open-hearth furnaces. In the last four decades and substantial amount of investigations, plenty of data became available mainly for modern oxygen steelmaking (OSM), when the oxygen supply interacts directly with the molten steel, increasing substantially the productivity. During the 60's, more consistent decarburization models were proposed [1], describing different blowing stages and most of the phenomenological approaches on the kinetic rates proposed, are still accepted today. In the 70's, significant advances were made [2-6] in understanding the decarburization rate dependence on oxygen injection flow rate and carbon mass transfer in liquid Fe-C melts.

During the 80's, electric arc furnace (EAF) production of high quality grades principally for flat products and special billet quality (SBQ) increased, causing a change in the charge of raw materials with lower tramp species and higher carbon contents. Therefore, the decarburization control became an important issue for the EAF process. In addition, in order to increase productivity and decrease electrical energy consumption, the oxygen consumption increased from 10-15 Nm^3/t up to 35-55 Nm^3/t. Consequently, the carbonaceous consumption increased to compensate the additional iron oxidation and yield losses.

Scrap availability is very volatile, and created a new demand for a more flexible EAF design regarding the raw materials blend fluctuations. This trend requires adaptive melting technology as well as more accurate operational procedures to enhance the iron yield and productivity. The purpose of the present work is to continue the development of a decarburization and slag formation model through industrial validation tests. Consistent prediction of iron oxidation and understanding how the oxy-reduction reactions in the EAF take place, could be managed to find an optimum operation.