CHAPTER I
INTRODUCTION

World economic expansion has an effect on the steel demand; as a consequence the global steel production has been growing steadily. The principal concerns for iron suppliers today is the issues of tight raw material market, higher costs due to the increase in the iron production, the adding of value to iron ore, the provision of the direct access to the electric arc furnace (EAF), and the environmental impact of steelmaking, including the need to decrease CO_2 emissions. (Tanaka, 2008), (Midrex Technologies, 2009).

Kobe Steel and Midrex have arrived at a viable solution for these concerns through a new technology known as IT Mark Three (ITmk3), based on their coal-based direct reduction technologies that have been in development over the past decade.

ITmk3®, which stands for "Ironmaking Technology Mark Three", was developed by Kobe Steel, Ltd with a support from Midrex Technologies. ITmk3 is a unique process that, through a rotary hearth furnace, turns iron ore fines and pulverized coal into iron nuggets of the same quality as the blast furnace pig iron. The ITmk3 Process is very flexible regarding carbon sources. The process can use coal, petroleum coke, or blast furnace dust, and other forms of solid, liquid and gaseous reductants. It is an environmentally friendly technology for producing a high quality iron product, of low capital investment, and highly suitable for developing countries that are growing with their steel industries. In addition, the ITmk3 Process can use relatively low-grade iron ores, which are difficult to use in the blast furnace iron making, to keep raw material costs down where mining companies typically supply raw but expensive materials to integrated blast-furnace steelmakers. In summary, the ITmk3 Process enables mining companies to produce and sell value-added iron nuggets to electric arc furnace steelmakers (Negami, 2001).

The purpose of this work is to study the ITmk3 process and parameters to control the quality and quantity of iron nuggets on a laboratory scale by using low grade iron ore which has 40-60% iron content and a low grade coal which has 40 % fixed carbon as the raw materials. In this study, the bentonite was used as a binder.

The parameters: weight ratio of mixture, the reduction time and the reduction temperature were varied to determine the suitable conditions.