CHAPTER IX

CONCLUSION

The experimental results on evolution of gas from D-R materials of various sources indicate that the volume of the gases evolved is proportional to the degree of metallization of DRI provided that there is sufficient amount of carbon in D-R materials to react with oxygen. The volume of the gases evolved is however independent of the rate of heating and the size of DRI grains utilized for evolution studies. The final reduction of D-R materials becomes complete before they reach their melting point. The principal component of the gas is CO with less than 10 percent CO_2.

The results of the studies on transfer of heat into inert spheres and DRI pellets immersed in a liquid slag which is initially at rest indicate that the short-term conduction is the dominant mechanism for transfer of heat to the immersed particles. The local evolution of gas from the particles decreases the thickness of the shell of slag that freezes on the particles. Although the local evolution of gas increases the rate of heating of the inert spheres, because of the changes of the thermal properties of the partially reduced pellets during final reduction, the rate of heating of the fully reduced pellets with no gas evolution is greater than that of the low metallized ones with gas evolution.

The predictions of the simulation model indicate that the melting rate of DRI pellets is substantially greater for mildly stirred slags (Nu=15) than for slags at rest. Vigorously boiled slags (Nu=30) are not necessarily desirable because of the relatively small increase they

create in the melting rate of the pellets and the difficulties they may produce in proper operation of the bath. The influence of the carbon (in excess to that necessary for total reduction of oxygen) and gangue contents of D-R materials on the melting rate of the pellets is relatively small. The rate of production of steel in an arc electric furnace can increase when highly metallized DRI materials are utilized. Pellets of smaller size and higher density can melt faster if the temperature of the bath can be maintained uniform and well above the melting point of the pellets.