

The Direct Reduction of Iron from its Ore Using Traditional Techniques



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Research Experience For Undergraduates
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Introduction

The direct reduction of iron from its ore was for thousands of years mankind's primary source of iron and steel. This process traditionally involved the heating of iron ore and fuel in a "bloomery" furnace under a reducing atmosphere to produce metallic iron that formed in a spongy mass or "bloom". Recently, direct reduction iron (DRI) has made a resurgence and has gained a role in the steel making industry.

Objectives

- Research the historical production of iron and steel
- Construct a bloomery furnace based on research
- Operate furnace and produce a usable billet of iron
- Analyze the results of the furnace run to understand how furnace conditions influence final product



Procedure



- Design a furnace based on historical research
- Construct furnace based on design
- Prepare ore via jaw and roll crushers
- Fire and operate furnace by the addition of ore and charcoal
- Process and analyze outputs



Results

- An operational bloomery furnace
- Production of workable iron
- Knowledge and appreciation of ancient smelting techniques



Conclusions

- Traditional direct reduction of iron requires both theoretical knowledge and technical skill

Future Work

- Scale up furnace design and perfect techniques
- Further explore and quantify process



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