

THE UNITED STEEL COMPANIES LIMITED

RESEARCH AND DEVELOPMENT DEPARTMENT.

GEOLOGY SECTION

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CONSTITUTION OF ARCHAEOLOGICAL SAMPLES

Submitted by Mr. H. Cleere

SYNOPSIS

Details are given of the constitution of four samples of roasted ore from Bardown.

CIRCULATION

Mr. H. Cleere, I.S.I.

I. INTRODUCTION

The samples examined were submitted for examination by Mr. H. Cleere of the Iron and Steel Institute. They are of roasted ore from Mr. Cleere's own archaeological site at Bardown.

II. CHEMICAL ANALYSIS

Bardown Roasted Ore Samples				
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Total Fe	54.5	53.0	68.9	46.9
FeO	0.03	0.13	0.03	0.13
SiO ₂	10.6	11.9	6.8	15.4
Al ₂ O ₃	6.9	5.2	3.5	7.2
TiO ₂	<1	<1	<1	<1
MnO	2.0	2.1	2.5	1.5
CaO	3.9	5.3	1.2	4.2
MgO	3.2	3.0	3.3	3.2
Cr ₂ O ₃	<1	<1	2.4	<1
V ₂ O ₅	<1	<1	<1	<1
BaO	<1	<1	<1	<1
P ₂ O ₅	0.54	0.37	0.79	1.03
Total S	Nil	Nil	Nil	0.02
Loss on ignition	0.67	0.65	3.46	4.90

III. MINERALOGY AND MICROSTRUCTURE

Essentially the samples are constituted very fine-grained iron oxides (mainly haematite) with subsidiary spinel solid solution (R_2O_3 , where R is Fe, Al, Mg, Mn, Si, etc), quartz and diopside. Details are as follows:-

- A and B. These comprise irregularly shaped lumps with reddish surfaces but internally purplish-red colour. They are comparatively hard and show a conchoidal fracture. Under the microscope the texture is seen to be a very fine-grained network of iron-oxide particles, in places showing rhombic patterns indicative of their origin from calcination of siderite. A little quartz, of clay and fine silt grade, is present. More compact patches of haematite probably resulted from roasting of original pyrite.
- C This sample is of brown to reddish-purple colour and roughly ovoid shape. It is comparatively soft apart from an external crystalline layer, originally probably goethite. The texture is very fine-grained and more quartz is present than in samples A and B. This represents ore that was oxidised (weathered) prior to roasting. That is, it was composed of limonite and goethite.

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- D This sample has a banded (bedded) nature but is mostly fine-grained purplish-red similar to A and B. There are thin layers with ooliths (originally probably chamosite) and casts of fossils (lamellibranchs) present.

Under the microscope, the layers are seen to contain much silt grade quartz.

IV. DISCUSSION

Prior to roasting the ores were:-

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| A and B | Siderite mudstone. |
| C | Weathered (limonitic) siderite mudstone. |
| D | Bedded siderite mudstone, with quartzose shelly and oolitic layers. |

Our information concerning the petrography of the Wealden Ore is sparse; it is possible that the Geological Survey might have more full information. Edmunds refers to the occurrence of clay ironstones and pale grey siderite, forming nodules or beds up to 2 ft thick, interbedded with shale and with considerable variation in silica content. The roasted samples described in this report represent fairly well material that was originally of this kind.

D. C. Goldring

REFERENCE

F.H. Edmunds, The Iron ore of the Weald. Symposium sur le Fer, v. 2, p. 451.