BAUXITE RESIDUE SINTER PHASE TRANSFORMATIONS

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INTRODUCTION

- Sintering process has been used commercially for alumina recovery from high silica bauxite
- Produces soluble $NaAlO_2$ by reacting sodium carbonate with aluminium components
- CaO can be added to stabilize silicates
- This work looks at applying this process to two distinct bauxite residues
- Mineral phases before and after sintering were quantified and potential reaction pathways investigated

METHODOLOGY

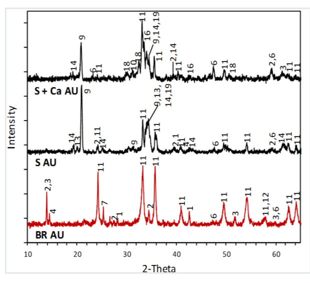
Step 1

Residues were characterized using XRF and sinter mixes made

Step 2

Sintered mix in muffle furnace at 900°C for 2 hour

Step 3



XRD and XDB used to quantify mineralogy

Step 4

Reaction pathways determined in conjunction with Factsage

- Two distinct bauxite residues (BR), Greek and Australian BR, were characterised both before and after sintering via X-ray Fluorescence (XRF).
- Mineralogy scan and quantification using X-Ray Diffraction (XRD) and XDB software
- XDB software uses a full-profile fit method to estimate the mineral composition of the sample.
- This, in conjunction with the Factsage Thermodynamic modelling package, was used to determine reaction pathways and basic thermodynamic data where possible

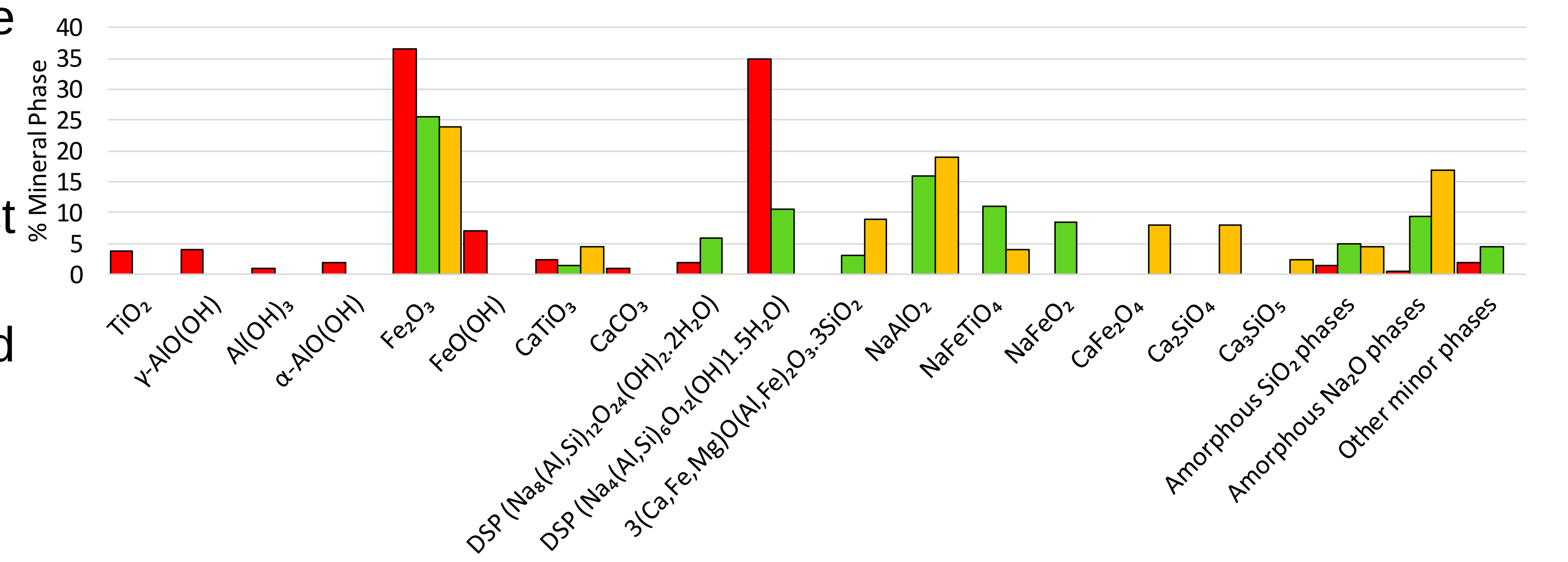
BR/SINTERS CHARACTERISATION

Sample	Al_2O_3	CaO	Fe_2O_3	Na_2O	SiO_2	TiO_2	LOI
BR Au	18.5	1.7	42.0	9.0	15.3	6.4	6.2
BR Gr	19.3	9.6	43.5	2.8	6.5	5.5	9.4
S Au	16.0	1.6	36.4	20.6	13.3	5.5	2.1
S Gr	18.7	9.1	41.0	16.5	5.8	5.0	2.5[1]
S + Ca Au	14.3	14.8	32.2	18.3	12.1	4.9	2.5
S + Ca Gr	16.3	19.7	36.0	14.5	5.1	4.4	2.5[1]

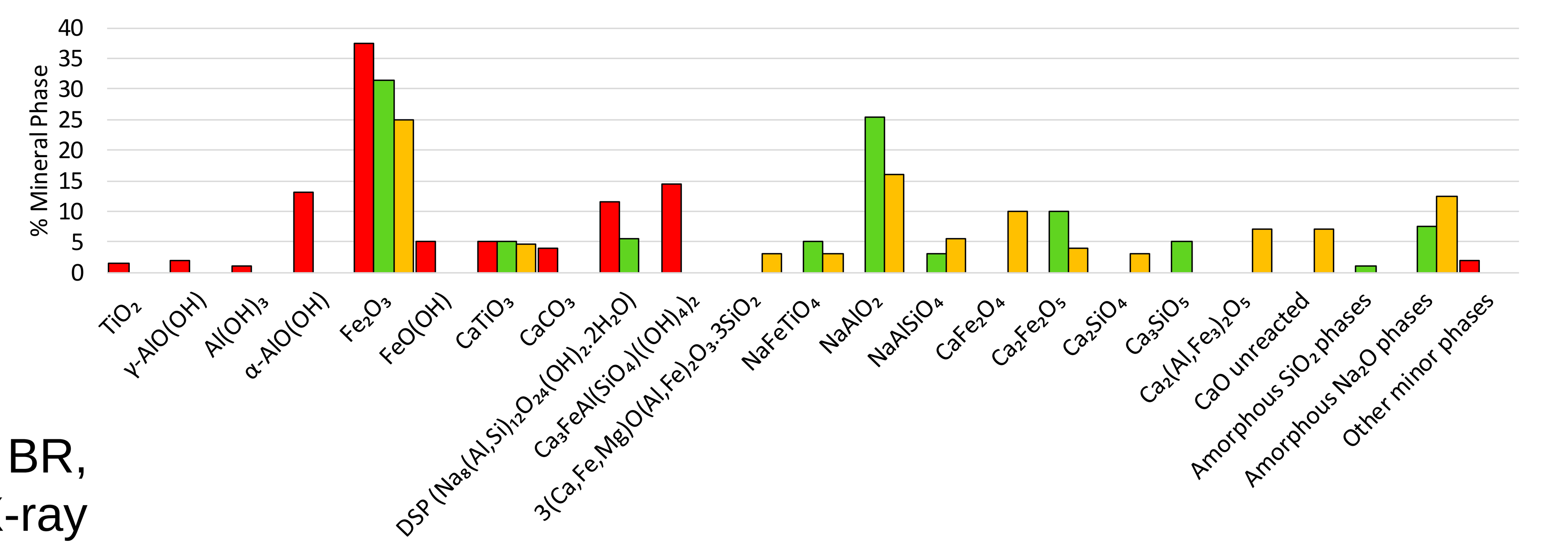
- Gr BR contains higher calcium and lower Na Si
- Au contains much higher Na and Al due to large amount of desilication products (DSP)

RESULTS

AUSTRALIAN BR/SINTERS

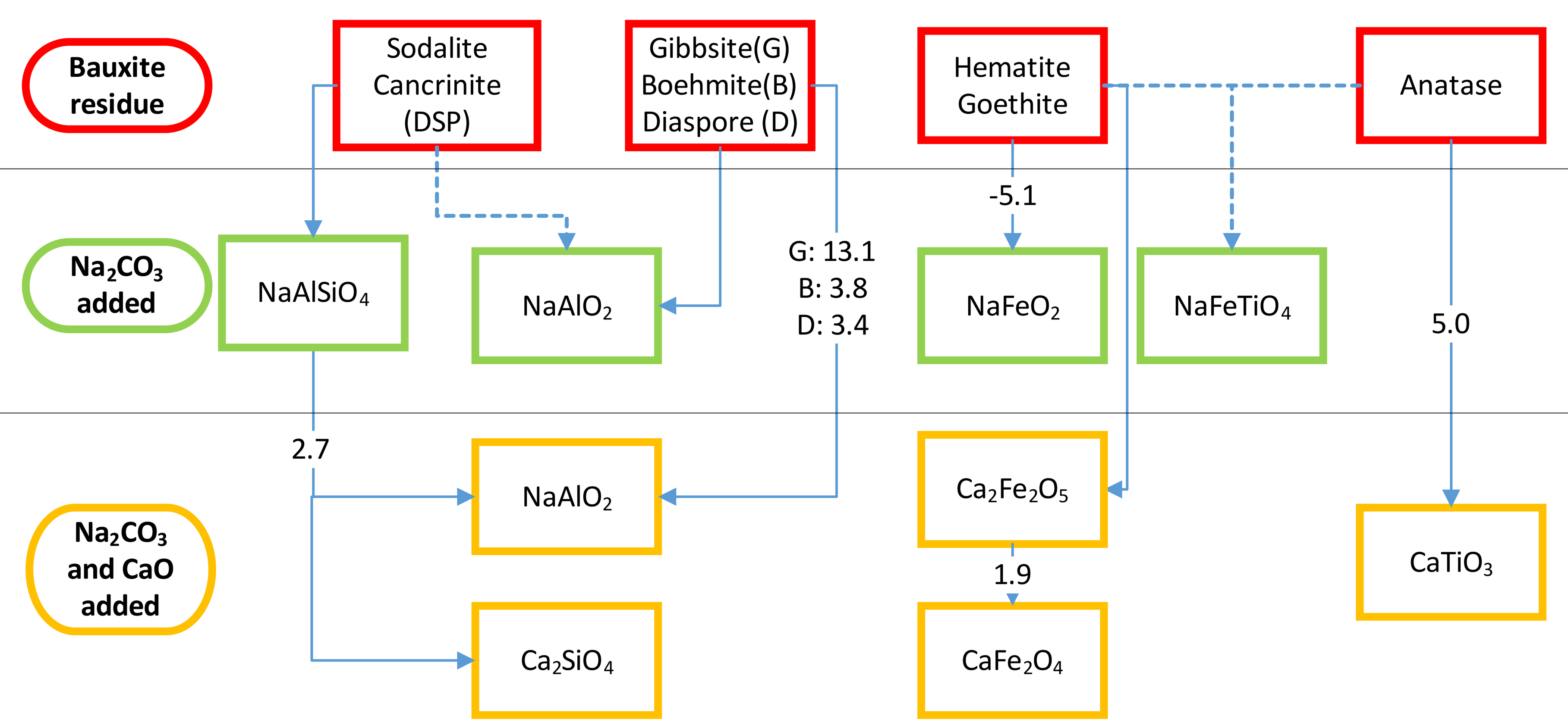


GREEK BR/SINTERS



PROPOSED REACTION PATHWAYS

- Addition of CaO did not aid in the formation of sodium aluminate
- CaO preferentially reacts with Iron phases
- Potential interaction of Ti and Fe to form Na-Ti-Fe phases
- Potential solid solution in Na-Al-Si phases



CONCLUSIONS

- Sinter product phases were similar for each residue despite inherent difference
- Quantitative mineral analysis and thermodynamic predictions were useful in understanding reaction pathways
- Detailed thermodynamic work is recommended

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