The Strategic University Steel Technology and Innovation Network Presents

Task 7 Direct Reduced Iron (DRI) by Renewable Energy – Generated H_2

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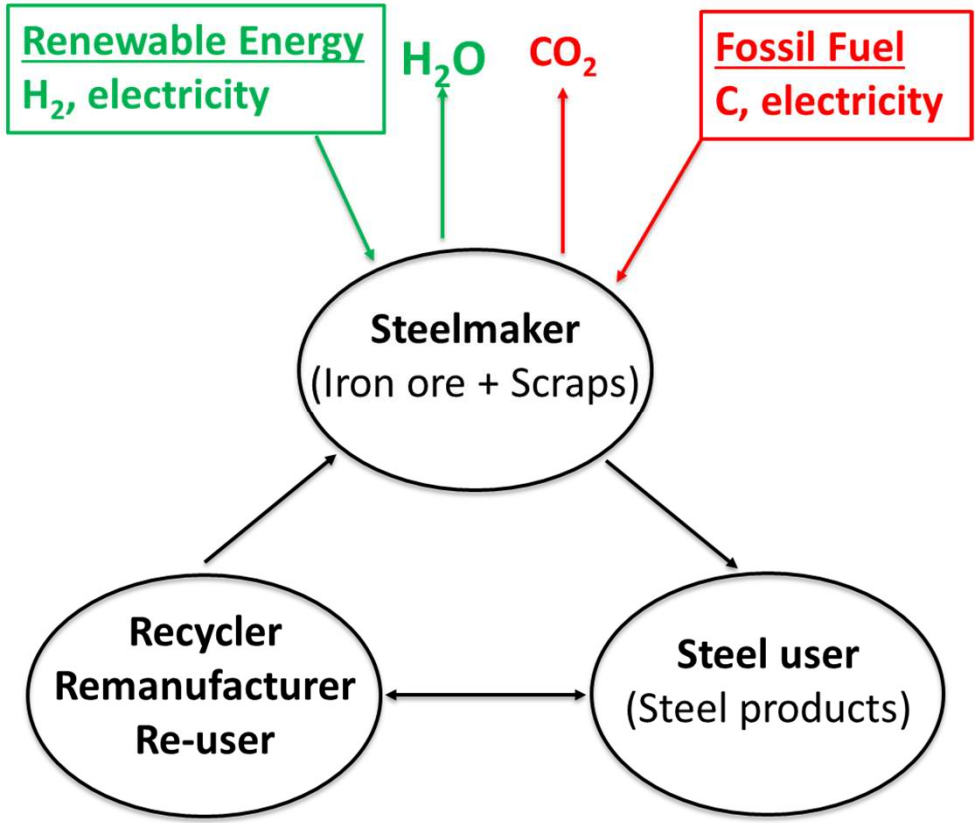
Introduction (I)

- Decarburisation is one of the globally recognised technology trends having far-reaching implications for the steel industry and its supply chain.
- Significant development of renewable energy enables the production of pure hydrogen by water electrolysis (instead of reforming natural gas) without environmental impact.
- Substantial work (e.g. cost, storage/distribution infrastructure) needs to be done to overcome the challenges for H_2 to be a major economy factor.
- Rapid deployment of renewable energy technologies and their promising applications in steel manufacturing have attracted great attention globally, such as H_2-based DRI production and electrolysis.

Introduction (II)

- DRI production by using renewable energy-generated hydrogen will be an ultra-low or even zero CO_2 emissions alternative ironmaking technology.
- Scrap replacement in BOF steelmaking; an ideal dilution additive for (high residual) steel scrap in the EAF route (DRI + scrap-based EAF) to produce high quality steels .



Approach (I)

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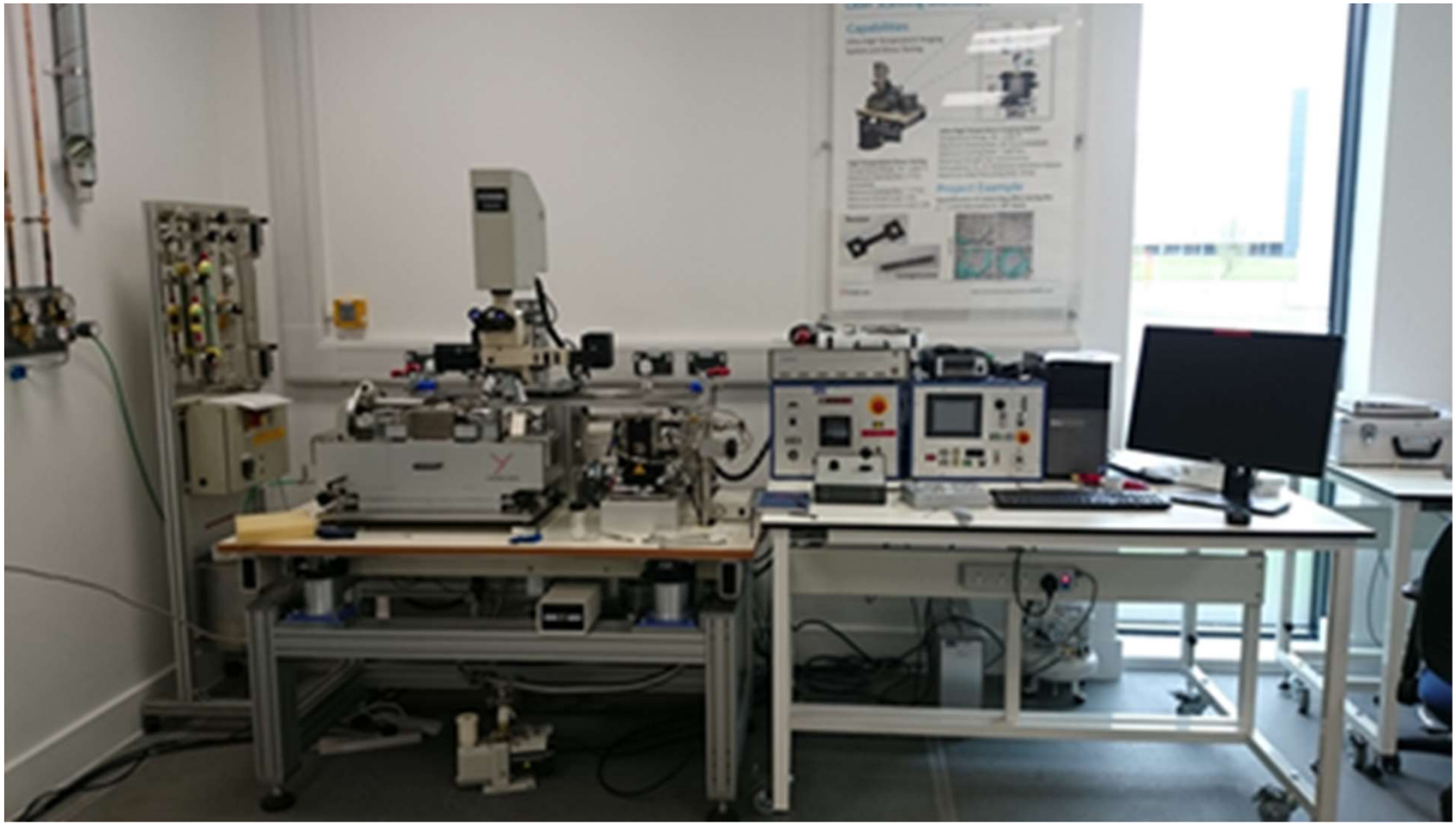
In-Situ observation on H_2 reduction of iron ore under HT-CLSM



Approach (II)

To investigate the behaviours of impurities and iron oxides in iron ores during H_2 reduction by using the bespoke gas furnace operating under flammable gas (left) with in-line mass spectrometer analysis of reacted gas composition (right).

Approach (III)

To reveal reaction mechanisms with the aid of advanced characterisation of the reacted samples

Outcomes

- Understanding of the state-of-the-art with regards to hydrogen applications in steel industry
- Recommendations on the application of hydrogen in UK steel industry
- Creation of fundamental knowledge on the production of direct reduced iron (DRI) by renewable energy-generated hydrogen, in particular reducing mechanisms and effects of impurities in the iron ore
- Contribution to the creation of an ultimately low carbon ironmaking process by using renewable energy-generated hydrogen
- Contribution to achieving net zero emissions UK steel industry by 2050.

The University Of Sheffield.

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