HYMAG'IN

RECYCLING FERROUS BYPRODUCTS

MATURATION

BENEFITS

- Recycling ferrous byproducts/wastes
- Production of magnetite micro-byproducts articles
- Production of high-purity H2

KEYWORDS

- Recycling
- Ferrous byproducts and wastes
- Hydrotermal oxidation
- Hydrogen
- Magnetite (nano)
- Iron and steel industry
- BOF Slags

INTELLECTUAL PROPERTY

- 2 patents registered

LABORATORY

- ISTerre - CNRS
- University of Grenoble Alpes

TECHNOLOGY MATURITY & USAGE

TRL (Technology readiness level)

1 2 3 **4** 5 6 7 8 9

URL (Usage readiness level)

1 2 3 **4** 5 6 7 8 9

PROJET

MATURATION

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A NOVEL WAY TO PRODUCE NANOMAGNETITE

CONTEXT

HyMag'In proposes a novel way for the valorisation of ferrous wastes and byproducts through their hydrotermal oxidation. Developed at ISTerre, this process leads to the formation of high-purity hydrogen (H2) and micro and nanoparticles of magnetite (Fe3O4)

TECHNOLOGY

The ferrous iron content of byproducts or wastes is oxided by liquid water under hydrotermal conditions (150 - 350°c and 20 - 100 bars). Temperature, pH, aqueous chemistry and particle size are key parameters which have been optimized as to improve the oxidation kinetics. Two products are recovered : magnetite and hydrogen.

ADVANTAGES

This process offers a novel way for recycling industrial ferrous by-products or wastes that are currently laid aside. The core innovation of the process lies in the production of magnetite in the 10 nm - 10 µm range. These particles show numerous physicochemical (high specific surface, high density) and magnetic properties that enable their use in a wide range of applications. In addition, high-purity hydrogen is produced during the process.

MATURITY

After is demonstration at lab scale (0.5 L), the process is currently performed on a first prototype (2L) that allows to inject a slurry semi continuously. Solid reagents can be added and recovered (ca. 200 kg per year) from high temperature and pressure without quenching the reactor. Processing of ferrous byproducts and wastes from various origin is under investigation (BOF slags, EAF slags, quenching dusts, ferrous wastes, etc.).

APPLICATIONS

- Water treatment
- Pigments and toners
- Catalysis
- Ferrofluids
- Electomagnetic shielding
- Fuel cell (For H2)