connected everything.

# Digital manufacturing of metal oxide nanocomposites via interpretable machine learning models

## Project Team:


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**Dr Direnc Pekaslan**
Computer Science, UoN

**Dr Andy Gill**
R&D manager, CPL Industries

**Uniper**

**Promethean particles**


## The project team and timeframe

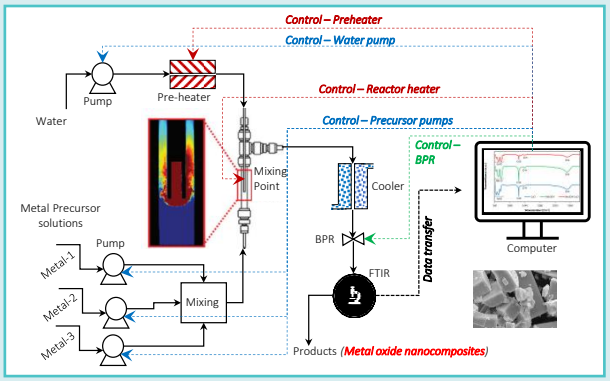
This project combines the complementary expertise in the synthesis of nanomaterials in Chemical Engineering (Dr Fatih Gulec, Dr Ed Lester) and machine learning in Computer Science (Dr Direnc Pekaslan) at the **University of Nottingham** to develop interpretable machine learning models for sustainable, continuous, and digital manufacturing of metal oxide nanocomposites with the industrial support on continuous inorganic material synthesis by **Promethean Particles** (Dr James Stephenson) and application of these metal oxide nanocomposites in chemical looping applications as a novel $CO_2$ capture technology by **CPL Industries** (Dr Andy Gill) and **Uniper** (Roger Brandwood). *Project runs between January - October 2023.*

## What does the project demonstrate?

This project aims to develop novel self-optimised algorithms through interpretable machine learning-based models to accelerate the digital manufacturing of novel metal oxide nanocomposites that can be used to capture carbon dioxide for the energy industry. We will use self-optimised algorithms (through interpretable machine learning-based synthesis) to optimise the manufacture of novel metal oxide nanocomposites using continuous hydrothermal synthesis (CHS) procedures. We will also show that CHS is the most sustainable, environmentally friendly, and cost-effective procedure for manufacturing these materials by comparing the legacy footprint of the materials produced vs alternative methods.

## Additional information regarding project, and key highlights wanting to address

The success of this project will bring new approaches to the manufacturing of metal oxide nanoparticles and nanocomposites (also potentially other nanomaterials; metal hydrides, metal-organic frameworks etc) via hydrothermal and solvothermal synthesis procedures and enable the manufacturing of novel nanomaterials structures for wider industrial applications; primarily thermal energy storage, $CO_2$ capture via advanced combustion, $H_2$ detection sensors, catalysis to boost $CO_2$ utilisation to hydrocarbons.

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