



## LMS Seminar

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### The use of iron powder as sustainable fuel

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#### ABSTRACT

An urgent decarbonization of the energy sector is required to combat global warming, as this sector accounts for more than 70% global CO<sub>2</sub> emissions due to the use of fossil fuel. Sustainable energy storage technology is a key to this transition due to the spatiotemporal intermittence of sustainable energy production based on solar, wind, hydropower, and geothermal energies, etc. Recently, metal fuels were proposed as high energy dense and sustainable energy carriers. In particular, iron powder is very promising due to its relatively low-cost, safety, abundance, and facilitated retrofit of the power plants. The stored energy is released during the exothermic oxidation of the metal powder, which is then regenerated by hydrogen-based solid-state direct reduction with hydrogen produced from renewable energy sources. While propitious, the fundamental physical and chemical mechanisms involved in the combustion and reduction of iron powder are still (at least partially) unknown. During this presentation, I will present the microstructural evolution of iron powder during a combustion-reduction cycle, and focus on the remaining challenges involved in the use of iron powder as metal fuel.

#### BIOGRAPHY

Dr.-Ing. Laurine Choisez is currently working at Université Catholique de Louvain, Belgium, as chargé de recherche FNRS on the topic of sustainable iron powder fuel. She started working on iron fuel during her post-doc at Max-Planck Institute for Iron Research in 2021. She received her PhD on the fracture mechanisms of TRIP-TWIP Ti alloys in 2021 at Université Catholique de Louvain, Belgium, where she also graduated as a materials science engineer in 2016. She also had the opportunity of studying martensitic transformation in ceramic shape memory alloys in 2015 at MIT. Dr. Choisez received the Chair Lhoist Berghmans grant in 2015, the FNRS grant for doctoral researcher in 2016 and the FNRS grant for postdoc research, received in 2022.