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Volteron - Technology for Green Steel

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VOLTERON™, an innovative technology developed by John Cockerill and ArcelorMittal to achieve carbonneutral steel production through direct iron electrolysis. This process represents a significant breakthrough in primary steelmaking by employing low-temperature electrowinning in an aqueous-based electrolyte, moving away from conventional blast furnace and basic oxygen furnace (BOF) methods, which are major contributors to global CO₂ emissions. VOLTERON™ technology is designed to transform iron oxide (Fe₂O₃) directly into pure iron metal plates using electricity, effectively eliminating CO2 emissions associated with carbonbased reduction methods. VOLTERON™ builds upon the findings from the SIDERWIN project, a Horizon 2020 EU-funded initiative, which has successfully demonstrated its potential at a pilot scale, with energy consumption and production efficiency meeting expected benchmarks. The process operates at a low temperature of approximately 110°C, which is significantly lower than traditional steelmaking temperatures, allowing for substantial energy savings with a consumption rate of approximately 3.6 MWh per ton of steel produced. The use of a vertically oriented cell design with industrial-scale cathode dimensions enhances scalability and efficiency, making the process suitable for large-scale deployment. VOLTERON™ offers a marked reduction in both energy usage and greenhouse gas emissions compared to alternative decarbonization routes, such as hydrogen-based direct reduction (DRI) or carbon capture and utilization (CCU) methods. Its ability to utilize standard iron ore without extensive pre-processing enhances its economic feasibility, positioning it as a leading solution in the global push for decarbonized steelmaking.

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