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## Development of hydrogen embrittlement resistant high-strength steel via hydrogen traps engineering

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**Abstract** Under the background of carbon peaking and carbon neutralization, there is an increasing demand for advanced hydrogen embrittlement (HE) resistant high strength steels and novel mitigation methods. Among the proposed approaches, deep hydrogen trap design is a promising method that enable synergistically improve the HE resistance and strength/ductility. This report briefly reviews the discovery and recognition of hydrogen traps in steels, introduces the new methods in mapping hydrogen traps in metals, and summarizes the mainstream ideas of hydrogen trap regulation in steel. Furthermore, taking the HE resistant pipeline steels and ultra-high strength hot stamping steels as examples, the new progresses in the design and fabrication of second phases-induced deep hydrogen traps, such as inclusions and precipitates are described in detail. Finally, based on the above contents, the future research directions of deep hydrogen trap design in high-strength steels are prospected.

**Keywords** hydrogen embrittlement; high-strength steel; hydrogen trap; hydrogen diffusion.