

[PO-F1]Poster Session 1

Symposium F

Mon. Oct 29, 2018 5:45 PM - 8:00 PM Poster Hall

[P1-37]Hydrogen trapping in carbon supersaturated α -iron and its decohesion effect in martensitic steel

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It is generally accepted that the martensite in steels is more susceptible to hydrogen embrittlement than the ferrite. The atomic-scale mechanism underlying this phenomenon, nevertheless, is not fully understood yet. Our first-principles calculations demonstrate hydrogen is more stable in carbon supersaturated martensite than in α -iron, due to the carbon-induced tetragonality in martensite lattice. The trapped hydrogen leads to remarkable decohesion between (110) planes both inside the martensite and along the martensite/ferrite interface, with the former being more significant than the latter. This decohesion can explain recent precise observations that in martensite/ferrite dual-phase steels the hydrogen-promoted crack was initiated in the martensite region and that in lath martensite steel it propagated not on lath boundaries but showed quasi-cleavage feature along (110) planes at very high hydrogen concentration.