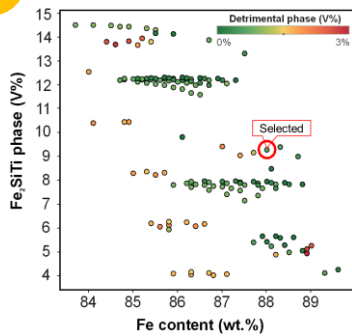


## Project Motivation and Goal

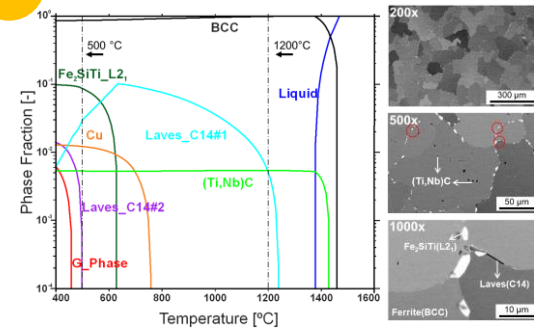
- HSLAs strengthened with Cu and M<sub>2</sub>C are suitable materials for naval and automobile applications due to their [1]: + High Strength + Excellent low-temperature toughness + Good weldability
- However, reports have suggested that lighter, Fe<sub>2</sub>SiTi Heusler precipitates could further boost HSLAs properties [2]
- To this end, we have design a HSLA steel composition + heat treatment, with Fe<sub>2</sub>SiTi as its major precipitate

## 1 ICME modeling for composition selection

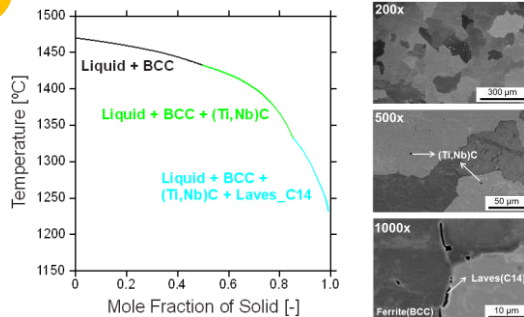


- Criteria:**
- ❖ Maximize Fe<sub>2</sub>SiTi fraction
  - ❖ Minimize detrimental phases fraction
  - ❖ Low alloy content

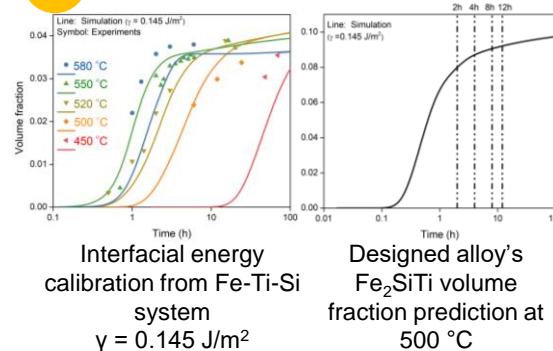
## 3 Homogenized microstructure: 1200 °C



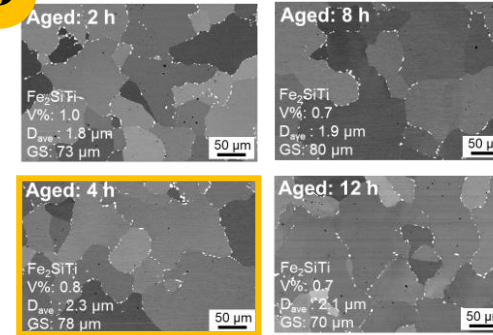
## 2 As-cast microstructure



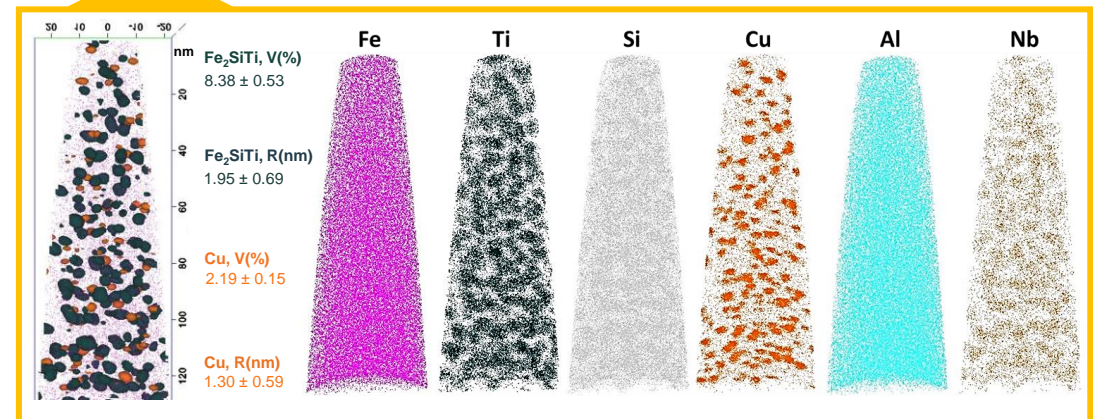
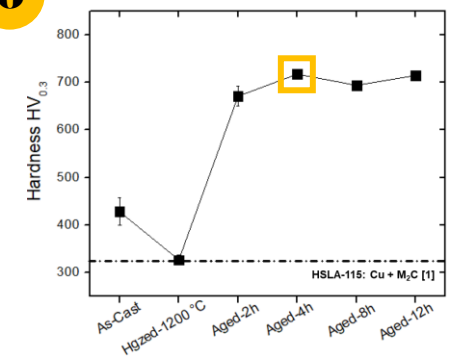
## 4 Aging model



## 5 Aged microstructure: 500 °C



## 6 Hardness Evolution



## References

- [1] D. Jain, D. Isheim, A. H. Hunter, and D. N. Seidman (2016) *Metall. Mater. Trans. A* vol. 47, no. 8, pp. 3860–3872.  
 [2] X. Wang, S. Sridar, and W. Xiong (2020) *J. Phase Equilibria Diffus.* vol. 41, pp. 804-818

## Acknowledgement:

N00014-17-1-2586

