Introduction

Hydride formation has been a primary issue for the degradation of Nb SRF cavities and there has been intensive studies on the hydride issue during last decades. It has been shown that hydride formation is significantly suppressed if we introduce impurities or defects by irradiation, which traps hydrogen in Nb [1]. Here, we present preliminary analyses of detailed morphology of Nb hydrides in Nb using transmission electron microscopy (TEM). We loaded hydrogen in two Nb bulk coupon, high and low RRR, and analyzed the hydride formation in TEM at RT. It shows that hydride formation is significantly suppressed in low RRR Nb coupon, demonstrating that impurities indeed play a significant role in the nucleation of hydrides, probably, by trapping hydrogen. In high RRR Nb, TEM analyses provide detailed morphology of hydride under the Nb surface at RT and show irregular dendritic shape. Further investigation of stability of hydrides under electron irradiation, nucleation and growth of Nb hydrides during cooling cycle using TEM is planned to understand the hydrides formation in nanoscale.

Experimental results

**EBSD analyses**

*Both high and low RRR Nb samples are mechanically polished and an vibrometry for 4 days to load H in Nb*

**TEM electron diffraction analyses**

- In high RRR, large hydrides are formed at RT in both two Nb grains
- In low RRR, there is no hydride formation

→ Effect of impurities on hydride formation is clear.

**Morphology of Nb hydrides near Nb surface**

- NbH, has a irregular shape with 1-3 micron size

Discussion & Conclusion

- Different hydride formation behavior in high and low RRR indicates that impurities in Nb play an important role in the hydride formation. It also agrees with the recent Internal Friction studies [4], it is possible that hydrosyns is trapped by impurities and growth of Nb hydrides are suppressed in low RRR Nb at RT.
- Further analyses are planned to investigate the effect of irradiation on the stability of hydrides and details of nucleation of hydrides in electropolished Nb during cooling cycle at cryogenic temperatures.

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