

[P1-38] Improvement of H_k and squareness in d -HDDR-treated Nd-Fe-B powders prepared using modified starting powder

REPM2025
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at Tsukuba, Japan

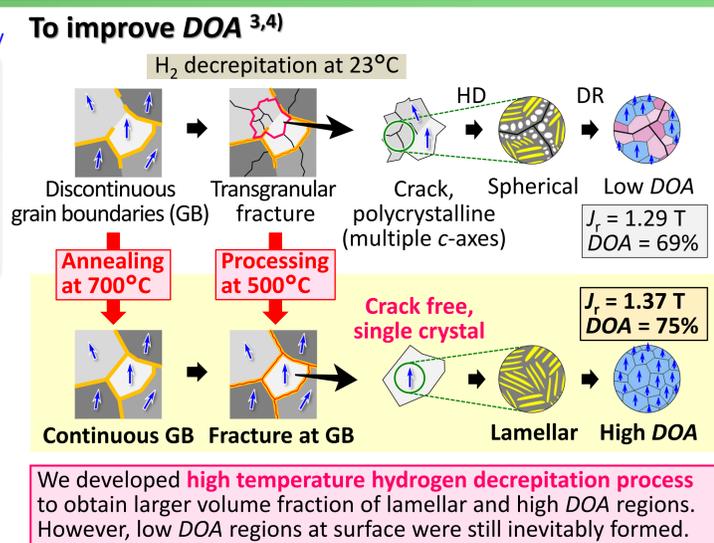
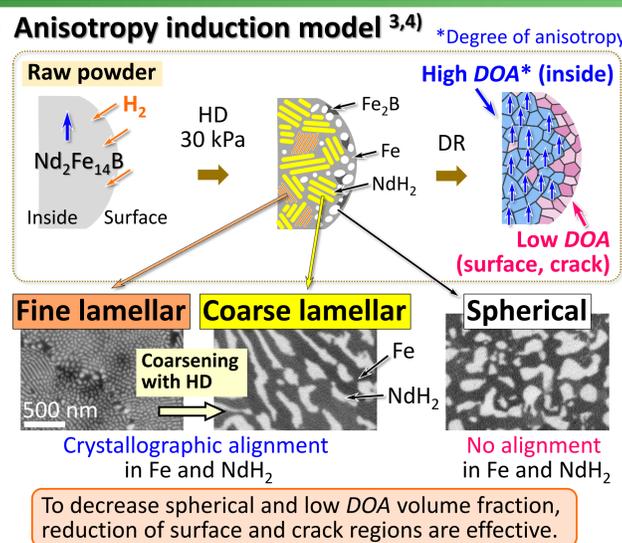
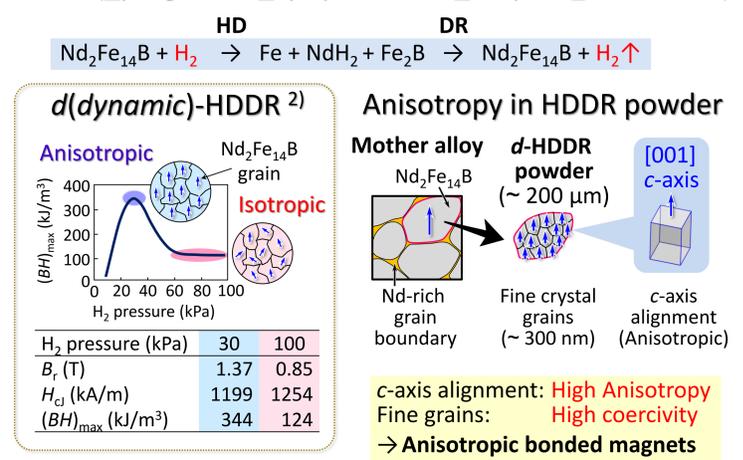
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Background

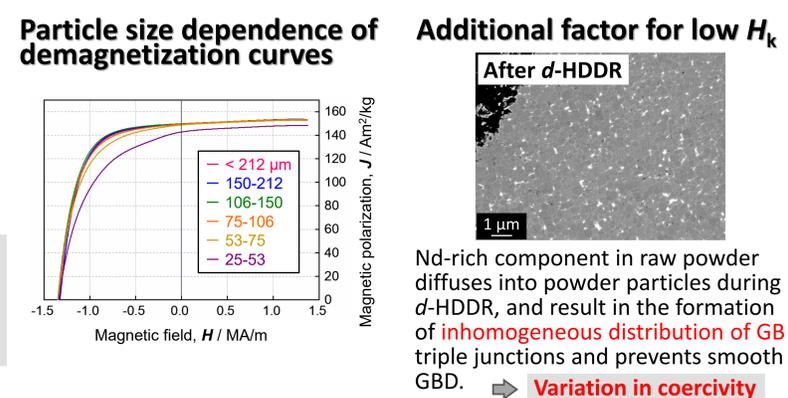
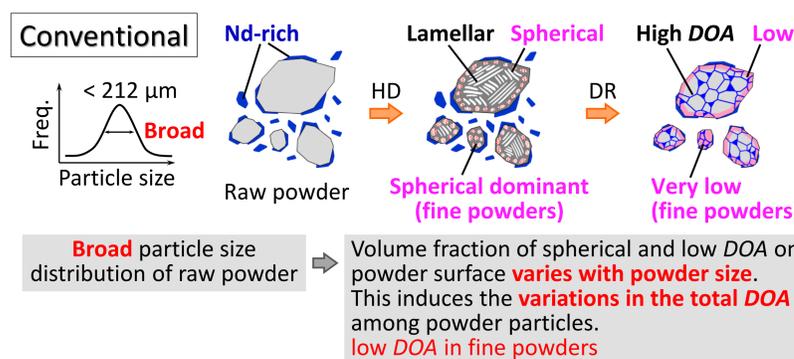
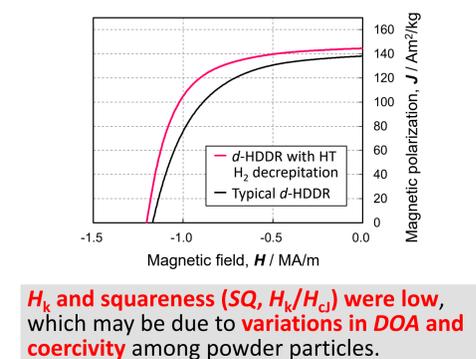
1. T. Takeshita and R. Nakayama, Proc. 10th Int'l. Workshop on R. E. Magnets & Their Applications, Kyoto, (1989) 551.
2. C. Mishima, et al., J. Magn. Soc. Jpn., 24 (2000) 407.

3. T. Horikawa et al., Sci. Tech. Adv. Mater., 22 (2021) 729.
4. T. Horikawa et al., The 170th Annual meeting of JIM, (2022) S7.2.

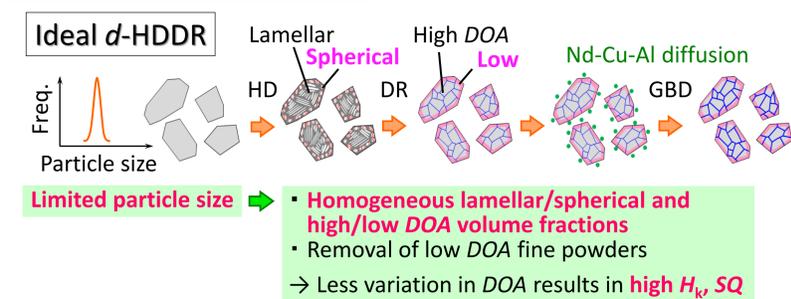
HDDR (Hydrogenation Disproportionation Desorption Recombination)¹⁾ Anisotropy induction model^{3,4)}



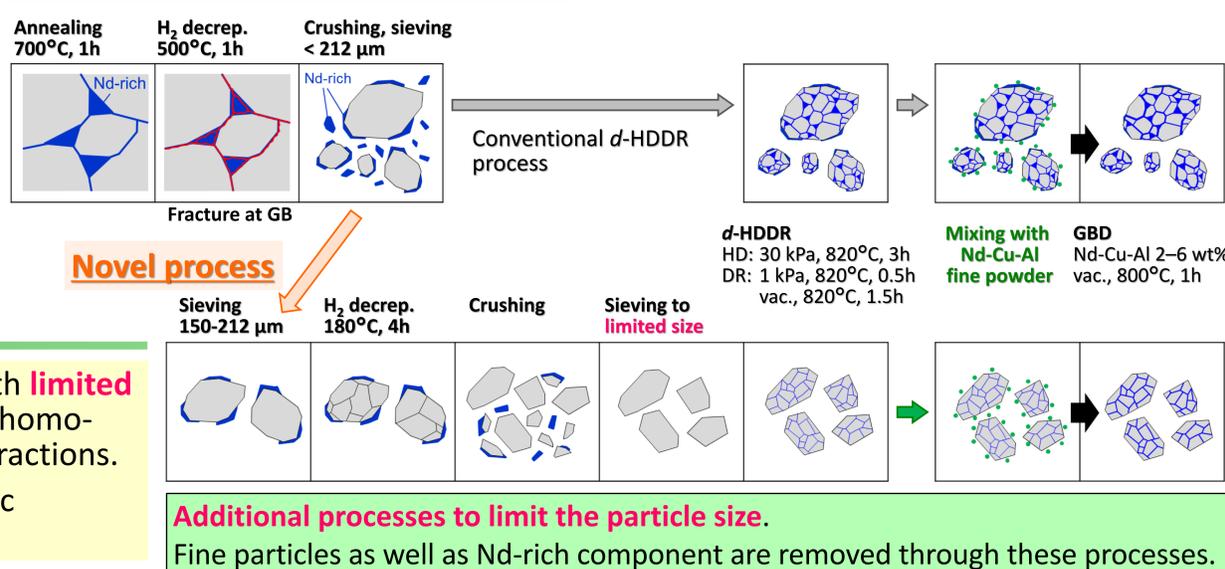
Problem



Approach



Experimental

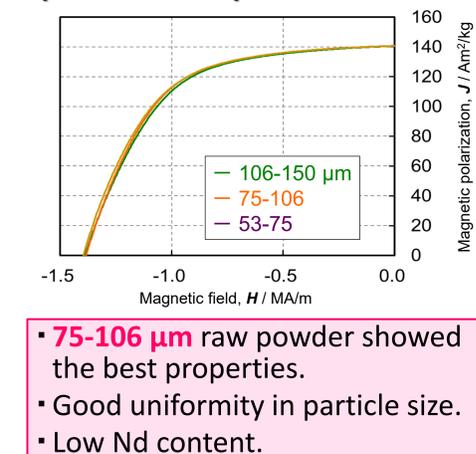


Purpose

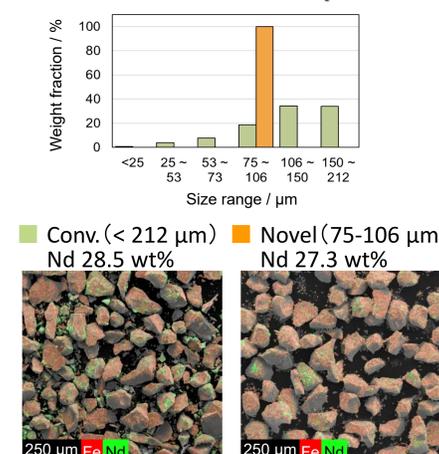
- To develop novel preparation process of raw powders with **limited particle size** for obtaining **higher H_k and SQ** by achieving homogeneous lamellar/spherical and resultant high/low DOA fractions.
- To investigate the effect of such raw powders on magnetic properties and microstructures.

Results and Discussion

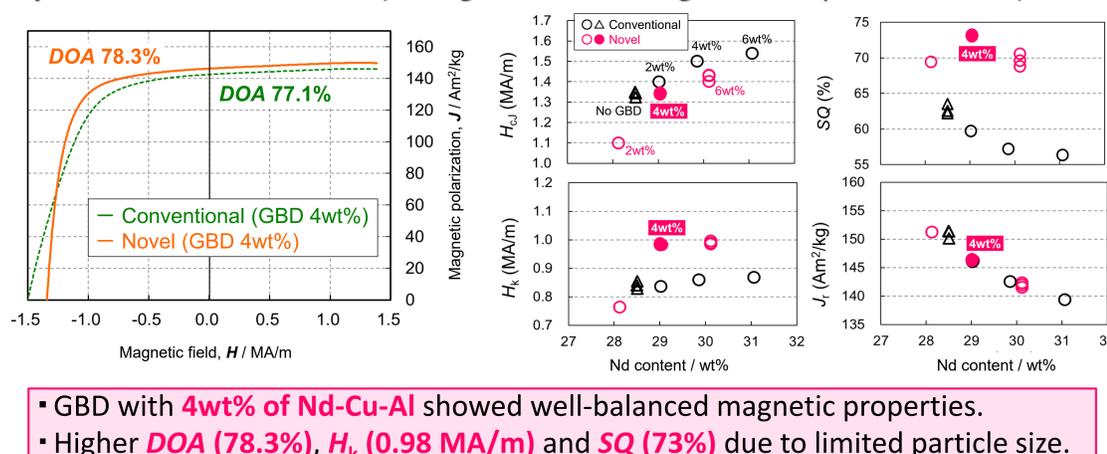
Optimization of particle size



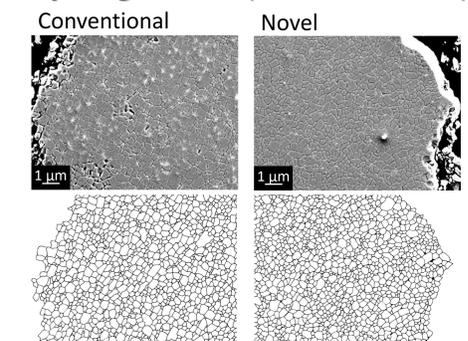
Size distribution of raw powders



Optimization of Nd content (mixing ratio of diffusing Nd-Cu-Al powder in GBD)

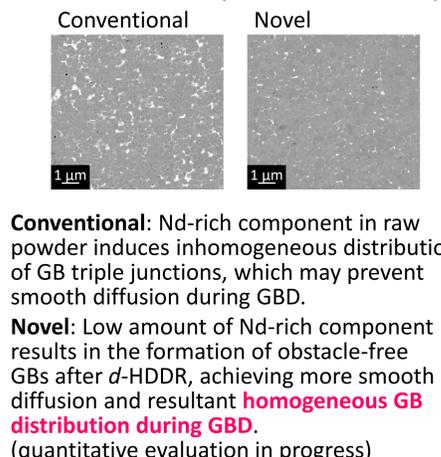


Crystal grain size (after GBD 4wt%)



- Sharp grain size distribution indicates the formation of more homogeneous microstructures.
- Homogeneous GB distribution \rightarrow **Less variations in coercivity**

GB distribution (after GBD 4wt%)



Summary

- We developed a novel d -HDDR process using raw powders with particle size of **75-106 μm .**
- After GBD (4wt%), higher H_k (**0.98 MA/m**) and **SQ (73%)** were obtained.
- Two factors for these results are as follows:
 - Less variations in DOA** due to homogeneous lamellar/spherical and resultant high/low DOA fractions achieved by **size-limited** raw powders.
 - Less variations in coercivity** may be due to high homogeneity in GB structures achieved by **lower Nd-rich component** in raw powders.