

October 04-06, 2018  
Amsterdam, NetherlandsJinping Suo et al., Nano Res Appl Volume:4  
DOI: 10.21767/2471-9838-C6-024

## EFFECT OF DIFFERENT NITRIDE NANO-PARTICLES ON THE HYDROGEN PERMEABILITY OF N-ODS STEEL

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ODS steel is one of the most potential materials for TBM (test blanket module) structural application. But it faces the issues of brittle at room temperature and tritium permeation. In this work, different content of N (in CrN, TiN and VN form) was added in the matrix powder to develop a new type of ODS steel (N-ODS steel), improve the toughness and hydrogen (deuterium, tritium) permeation resistance property. The effect of different content and kind of nitride nano-particles on the hydrogen permeability of N-ODS steel was studied. The N-ODS powder were fabricated by mechanical alloying, followed with reduction in hydrogen, and then sintered by spark plasma sintering at 1050°C for 10 min. After sintering, all the specimens were normalized at 1050°C for 0.5h, and then furnace cooled to room temperature. The TEM image showed that N-ODS steel is nanostructure and due to addition of N, nanoscale particles of CrN (TiN, VN) and some nuclear/shell structural precipitates were formed in the N-ODS steel. Electrochemical hydrogen permeation technique was used to evaluate the hydrogen permeability of N-ODS steel. The results reveal that the hydrogen diffusion coefficient decreased with the increasing of content of N (in CrN form). Besides, different N sources (CrN, TiN, VN) also have significant effects. The hydrogen diffusion coefficient of N-ODS steel with 1% TiN was only half of diffusion coefficient of steel with 1% CrN and steel with 1% VN. When the content of TiN increased, the hydrogen diffusivity decreased further. The N-ODS steel with N in TiN form exhibits the best hydrogen resistance property.



### Biography

Jinping Suo has completed his PhD at 2000 from Beijing Iron and steel General Institute of Material Science. He is a Professor of Material Science at Huazhong University of Science and Technology. He focuses on research of structural materials, tritium resistance coatings and so on. He has published more than 50 papers on *Corrosion Science*, *Journal of Nuclear Materials*, *Surface and Coatings Technology* and other journals, and also got several patents.

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