



# Ammonia Synthesis Catalysts : Innovation and Practice

*Huazhang Liu*

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This book provides a review of worldwide developments in ammonia synthesis catalysts over the last 30 years. It focuses on the new generation of  $Fe_{1-x}O$  based catalysts and ruthenium catalysts — both are major breakthroughs for fused iron catalysts. The basic theory for ammonia synthesis is systematically explained, covering topics such as the chemical components, crystal structure, preparation, reduction, performance evaluation, characterization of the catalysts, the mechanism and kinetics of ammonia synthesis reaction. Both theory and practice are combined in this presentation, with emphasis on the research methods, application and exploitation of catalysts.

The comprehensive volume includes an assessment of the economic and engineering aspects of ammonia plants based on the performance of catalysts. Recent developments in photo-catalysis, electro-catalysis, biocatalysis and new uses of ammonia are also introduced in this book.

The author, Professor Huazhang Liu, has been engaged in research and practice for more than 50 years in this field and was the inventor of the first  $Fe_{1-x}O$  based catalysts in the world. He has done a lot of research on  $Fe_3O_4$  based- and ruthenium based-catalysts, and has published more than 300 papers and obtained 21 patents during his career.

### Contents:

- Historical Evolution of Catalysts for Ammonia Synthesis
- Catalytic Reaction Mechanisms of Ammonia Synthesis
- Chemical Composition and Structure of Fused Iron Catalysts
- Preparation of Fused Iron Catalysts
- Reduction of Fused Iron Catalysts
- Ruthenium Based Ammonia Synthesis Catalysts
- Performance Evaluation and Characterization of Catalysts
- Performance and Application of Catalysts
- Effect of Catalyst Performance on the Economic Benefits of Catalytic Process
- Innovation and Speculation

**Readership:** Researchers in academia and industry working on catalysts for ammonia synthesis.



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