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Nota di contenuto	Part I: Green ammonia as energy carrier -- 1. Ammonia as green fuel with energy science view -- 2. Physical and chemical properties of ammonia as energy carrier -- 3. Possibility of Ammonia fuel & Japanese hydrogen technology -- 4. Ammonia’s Role in the Hydrogen Society -- Part II: Solar heat storage -- 5. Solar-thermal energy conversion system; design and practice: solar selective absorbers based on semiconducting -FeSi2 -- 6. Solar heat storage system and the materials -- 7. Enhancing corrosion resistance of stainless steel by hot-dip aluminizing for high temperature solar thermal application -- 8. Solar-thermal energy conversion -- Part III: Hydrogen production

through electrolysis and thermochemical reactions -- 9. Steam electrolysis cells that can operate at 600 -- 10. Advances in solid oxide electrolysis cell -- 11. Hydrogen production from solar heat; Membrane IS process -- 12. Production of sulfuric acid and hydrogen iodine by Bunsen reaction assisted with membrane -- 13. Oxygen productionby sulfuric acid decomposition assisted with membrane -- 14. Hydrogen production by hydrogen iodine decomposition assisted with membrane -- 15. Corrosion-resistant material for IS process -- Part IV: CO2 free ammonia synthesis under industrial conditions -- 16. Green ammonia production system -- 17. Comparison of several ammonia catalysts worked under industrial conditions -- 18. Influence of H2 / N2 Ratio on Dynamic Behavior of Ammonia Production on Ru Catalyst -- 19. Development of industrial ammonia catalyst using ruthenium -- 20. Rare earth oxide supported Ru catalysts for ammonia synthesis -- 21. Ammonia synthesis from N2-H2O using electrochemical hydrogen-membrane reactor with Ru catalyst and phosphate electrodes -- Part V: Ammonia source hydrogen station -- 22. Production technology of hydrogen for fuel cell vehicles from ammonia -- 23. Ruthenium catalyst development for effective ammonia decomposition -- 24. High purity hydrogen production from ammonia decomposition and removal gas -- 25. Development of vanadium alloy film for hydrogen purification -- Part VI: Ammonia fuel cell -- 26. Ammonia decomposition catalysts for fuel cell application -- 27. Development of component materials for ammonia fueled solid oxide fuel cells (SOFCs) -- 28. Stack evaluation of ammonia fueled SOFCs -- 29. Simulation of ammonia fueled SOFCs -- 30. Utilization of ammonia for low temperature fuel cells -- Part VII: Ammonia combustion mechanism and application for internal combustion engines -- 31. Significance and impact of ammonia combustion research -- 32. Demonstration of ammonia fuel with small gas turbines -- 33. Demonstration test of ammonia/natural gas co-firing power generation with 2 MW class gas turbine -- 34. Development of ammonia utilization technology for large gas turbines for power generation -- 35. Advanced co-firing method with low NOx at gas turbine considering the detailed chemistry -- 36. Automobile reciprocal engines fueled with ammonia -- 37. Fundamental study on application of ammonia as a fuel to marine diesel engines -- Part VIII: Coal-ammonia co-firing for power generation -- 38. Ammonia co-firing technology applicable to purverized coal fired boilers -- 39. Development of the coal co-firing technology with ammonia and numerical evaluation of the boiler performance -- 40. Test of the cofiring of ammonia and coal at Mizushima Powrer Station -- 41. Characteristics of coal-ammonia co-firing phenomena -- Part IX: Ammonia combustion for industrial furnaces -- 42. Review of fundamental study of ammonia direct combustion in industrial furnaces Ammonia combustion for industrial furnace -- 43. Development of impinging jet burner using ammonia fuel for degreading steel sheets -- Part X: Evaluation of green ammonia fuel in view of LCA and economics -- 44. Basic concept of NH3 fuel LCA (including N2O problem) -- 45. Well to Wheel Carbon intensity of various ammonia fuel -- 46. What ammonia? What cost ammonia? -- 47. Ammonia energy; expectation and challenge.

Sommario/riassunto

This book describes important findings in intensive studies conducted in Japan on ammonia as an energy carrier. It illustrates an advanced solar-heat capture system and storage materials at 600°C and hydrogen production with SOECs and a new IS method through the use of heat. New industrial ammonia catalysts and a demonstration process that started running in Fukushima are also introduced. Advanced ammonia decomposition catalysts and the process that were developed

for use by the hydrogen station are presented. An advanced direct ammonia fuel cell was developed and the base data are shown. The book explains that ammonia is used as a fuel for industrial applications because its burning can be controlled without emitting extra NOx in the gas turbine and the real coal co-fired power plant. These breakthroughs have made a strong impact in the world as a practical technology for CO2 reduction. Also provided here are the scientific and industrial backgrounds as well as the environmental assessment and economic evaluation for the future. This book will be helpful for all who are interested in energy technology—researchers, students, and strategy planners at companies and in the government.