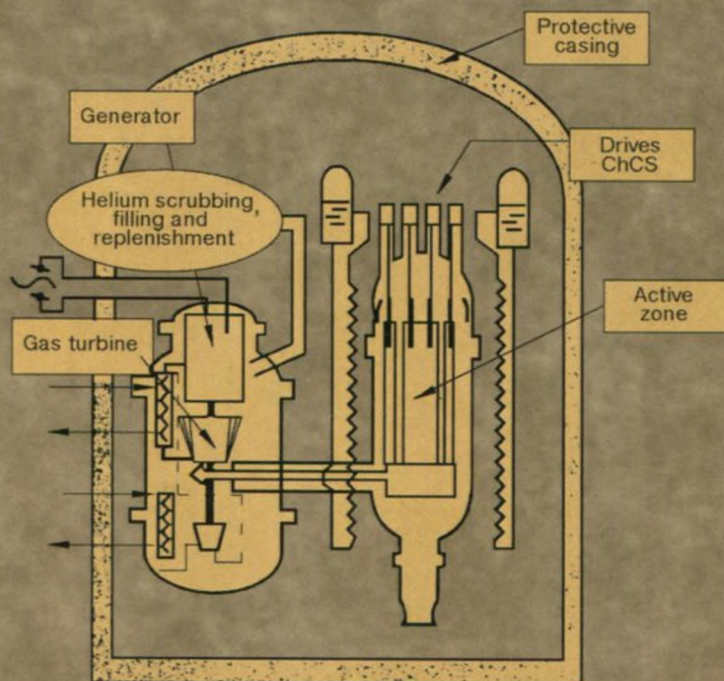


L.H. KOZIN, S.V. VOLKOV, I.N. SKRYPTU

620.92
K 80

MODERN HYDROGEN ENERGETICS AND ECOLOGY



NATIONAL ACADEMY OF SCIENCES OF UKRAINE
VERNADSKY INSTITUTE OF GENERAL
AND INORGANIC CHEMISTRY

НАЦІОНАЛЬНА АКАДЕМІЯ НАУК УКРАЇНИ
ІНСТИТУТ ЗАГАЛЬНОЇ ТА НЕОРГАНІЧНОЇ ХІМІЇ
ім. В. І. ВЕРНАДСЬКОГО

СУЧАСНА ВОДНЕВА ЕНЕРГЕТИКА ТА ЕКОЛОГІЯ

*ПРОЕКТ
«УКРАЇНСЬКА НАУКОВА КНИГА
ІНОЗЕМНОЮ МОВОЮ»*

КИЇВ
АКАДЕМПЕРІОДИКА
2019

Л. Х. КОЗІН, С. В. ВОЛКОВ, І. М. СКРИПТУН

L. H. KOZIN, S. V. VOLKOV, I. N. SKRYPTUN

MODERN HYDROGEN ENERGETICS AND ECOLOGY

PROJECT
«UKRAINIAN SCIENTIFIC BOOK
IN A FOREIGN LANGUAGE»

KYIV
AKADEMPERIODYKA
2019

Reviewers:

Yu. M. SOLONIN, Academician of the NAS of Ukraine,
Professor, Dr. Sci. (Phys. & Math.)

A. O. OMELCHUK, Corresponding member of the NAS of Ukraine,
Professor, Dr. Sci. (Chem.)

*Approved for publication by Vernadsky Institute
of General and Inorganic Chemistry of the NAS of Ukraine
(22.06.2017, Protocol No. 6)*

***Publication was funded in the frame of the Target Complex
Program "Creation and Development of Scientific Publishing Complex
of the National Academy of Sciences of Ukraine"***

Kozin L. H.

K59 Modern Hydrogen Energetics and Ecology / L. H. Kozin, S. V. Volkov, I. N. Skryptun; Vernadsky Institute of General and Inorganic Chemistry of the NAS of Ukraine. – Kyiv: Akadempriodyka, 2019. – 364 p.
ISBN 978-966-360-392-6

The book deals with the problems of the world, including Ukraine, provision with power carriers as well as peculiarities of the new developing field of knowledge and industry — hydrogen energetics, which is the only ecologically pure method of power generation of the future. Self-sufficiency conditions of unrenewable and renewable power sources for civilization existence on the Earth are described. The authors' hypotheses concerning oil, natural gas and hard coal origin are discussed. Special attention is paid to ecologic aspects, in particular, greenhouse effect, ozone holes power generation.

Intended for engineering staff and research scientists engaged in the problems of power prospecting, including prospecting and production of unrenewable and renewable power sources, as well as for postgraduates and students of the secondary and higher educational institutions.

UDK 620.9:504

ISBN 978-966-360-392-6

© Vernadsky Institute of General and Inorganic
Chemistry of the NAS of Ukraine, 2019
© Akadempriodyka, design, 2019

CONTENT

INTRODUCTION	5
<hr/>	
CHAPTER 1	
ENERGY ENGINEERING PROGRESS, HYDROGEN AND ECOLOGY	11
<hr/>	
CHAPTER 2	
ENERGY BALANCE	27
2.1. Energetics on organic fuel	27
2.2. Nuclear energetics	34
<hr/>	
CHAPTER 3	
ENERGY RESOURCES OF FOSSIL FUELS IN THE WORLD	55
3.1. Fossil energy resources on the base of hydrocarbons....	55
3.2. Hypothesis of hydrocarbon fuels origin on the earth....	72
3.3. Energy, economy and gross domestic product.....	79
<hr/>	
CHAPTER 4	
NUCLEAR ENERGETICS	91
4.1. Nuclear electroenergetics.....	91
4.2. High-temperature liquid-salt reactors.....	107
4.3. Thermonuclear energetics	109
4.4. Ecologic safety of nuclear energetics.....	115
	361

CONTENT

CHAPTER 5

POWER GENERATION IN THE USA, GERMANY, RUSSIA AND UKRAINE	129
5.1. Power industry of the USA.....	129
5.2. Power industry of Germany.....	131
5.3. Power industry in Russia.....	133
5.4. Power industry of Ukraine	137

CHAPTER 6

HYDROGEN ENERGETICS	155
6.1. Physico-chemical properties of hydrogen and metal hydrides.....	155
6.2. Methods of hydrogen production.....	169
6.3. Hydrogen, coal, turf and synthetic gasoline	218

CHAPTER 7

HYDROGEN AS ECOLOGICALLY PURE AND UNIQUE ENERGY CARRIER AND REAGENT	233
7.1. Hydrogen fuel and economy	233
7.2. Aviation and spacecrafts.....	239
7.3. Motor transport.....	245
7.4. Hydrogen – an element as well as chemical and nuclear reagent	251
7.5. Hydrogen and Industry.....	255
7.6. Hydrogen in everyday Life	256

CHAPTER 8

ECOLOGY AND ENVIRONMENT	263
8.1. Greenhouse effect.....	265
8.2. Ozone holes.....	285
8.3. Acid rains.....	300
8.4. «Thermal contamination» of planet Earth.....	311
362	

CHAPTER 9

HYDROGEN ENERGETICS AND OTHER ENERGY SOURCES IN THE THIRD MILLENNIUM	327
9.1. Hydrocarbon fuel	327
9.2. Nuclear and hydrogen energetics.....	377
9.3. Renewable energy sources	346
9.4. World demand in energy in the 21 st century and third millennium.....	350
CONCLUSION.....	357