Handbook of Air Pollution from Internal Combustion Engines

Pollutant Formation and Control



Edited by ERAN SHER



Handbook of Air Pollution from Internal Combustion Engines Pollutant Formation and Control

Edited by Eran Sher



ACADEMIC PRESS

Boston San Diego New York London Sydney Tokyo Toronto

This book belongs to Gregory Davis (gdavis@kettering.edu)



This book is printed on acid-free paper. \otimes

Copyright © 1998 by Academic Press.

All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

ACADEMIC PRESS

525 B Street, Suite 1900, San Diego, CA 92101, USA 1300 Boylston Street, Chestnut Hill, MA 02167, USA http://www.apnet.com

United Kingdom Edition published by ACADEMIC PRESS LIMITED 24-28 Oval Road, London NW1 7DX http://www.hbuk/co.uk/ap/

ISBN: 0-12-639855-0

Library of Congress Cataloging-in-Publication Data

Handbook of air pollution from internal combustion engines: pollutant formation and control / edited by Eran Sher.

p. cm.

Includes bibliographical references and index.

ISBN 0-12-639855-0 (alk. paper)

- 1. Motor vehicles—Motors—Exhaust gas—Environmental aspects.
- 2. Internal combustion engines—Environmental aspects. 3. Air-

Pollution. I. Sher, Eran.

TD886.5.H36 1998

629.25'28—dc21

97-48256

CIP

Printed in the United States of America

98 99 00 01 02 IP 9 8 7 6 5 4 3 2 1

This book belongs to Gregory Davis (gdavis@kettering.edu)



Contents

Acknowledgments			
	reagments	xix	
PART I			
OVERVIEW			
-	otor Vehicle Emissions Control: Past hievements, Future Prospects	3	
Directo	eywood Sun Jae Professor of Mechanical Engineering, r, Sloan Automotive Laboratory, Massachusetts Institute of ogy, Massachusetts, United States		
1.1	Synopsis	4	
1.2	Introduction	4	
1.3	Motor Vehicles and Air Pollution	5	
1.4	The Science of Pollutant Formation and Control	9	
1.5	Effectiveness of Current Emission Control Technology	15	
1.6	Direct-Injection Engines, Two-Strokes, and Diesels	17	
1.7	Future Prospects	20 23	
PART II			
GLOBA	L ASPECTS	25	
2. Env	vironment Aspects of Air Pollution	27	
Center j	Department of Mechanical Engineering, The Pearlstone for Aeronautical Engineering Studies, Ben-Gurion University of ev, Beer Sheva, Israel		
2.1	Introduction	28	
		vii	
		, ,,	

This book belongs to Gregory Davis (gdavis@kettering.edu)



viii		(Contents
	2.2 2.3	Global Effects	35
3.	Hea	lth Aspects of Air Pollution	42
		Sarel Division of Community Medicine, Faculty of Health, Soroka Medical Center, Beer-Sheva, Israel Anatomy and Physiology of the Respiratory System Defense Mechanisms of the Lung	
	3.3	Ventilatory Function Tests	
	3.4	Principles of Inhalation Injuries	
	3.5	Airborne Pollutants Causing Cancer and other Diseases	
		References	64
4.	Ecoi	nomic and Planning Aspects of Transportation	
		ssion	65
		laut Faculty of Architecture and Town Planning, Technion, stitute of Technology, Haifa, Israel	
	n E. P Haifa,	Plaut Graduate School of Business Administration, Universi Haifa, Israel	ty
	4.1 4.2 4.3	Introduction	68
		Source Emissions	
	4.4 4.5	Administrative Methods of Pollution Emissions Control	
	4.5	Indirect Pricing Mechanisms	
	1.0	References	
PAR	RT III		
SPA	RK-I	GNITION ENGINES	. 9 1
5.		oductory Chapter. Overview and the Role Engines with Optical Access	93
		one Department of Engineering Science, University of Oxford, United Kingdom	
	5.1	Introduction	94
	5.2	Engines with Optical Access	
	5.3	High-Speed Photography	
	5.4 5.5	Flame Front Detection	

This book belongs to Gregory Davis (gdavis@kettering.edu)



DOCKET

Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time** alerts and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

