

# *Atmospheric Pollution*

## *Lecture 1*

*Sahraei*

*Physics Department*

*Razi university*

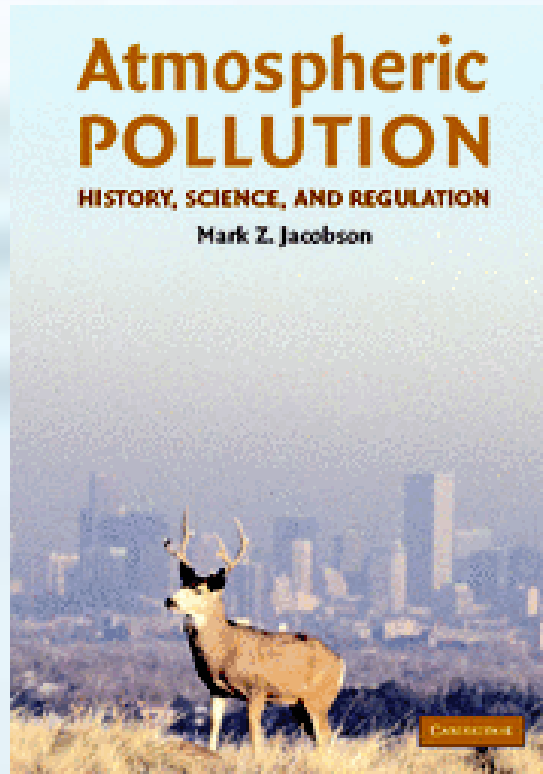
*<http://www.razi.ac.ir/sahraei>*



## *References*

1- Atmospheric Pollution: History, Science, and Regulation

By Mark Z. Jacobson, Cambridge University Press, 399 pp. (2002)



This textbook provides an introduction to the history and science of major air pollution issues.

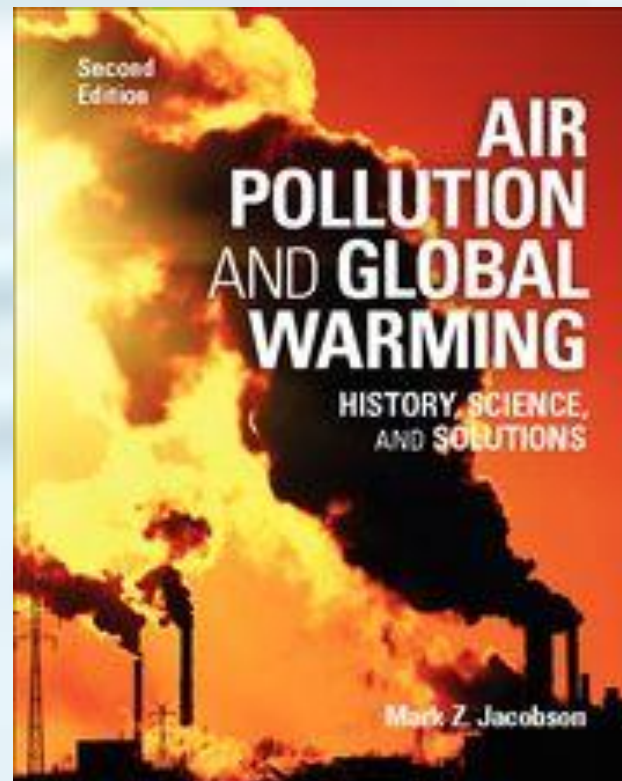
The book begins with an introduction to the history of discovery of chemicals in the atmosphere, and then moves on to a discussion of the evolution of the earth's atmosphere, and the structure and composition of the present-day atmosphere.

It then discusses five major atmospheric pollution topics: urban outdoor air pollution, indoor air pollution, acid deposition, stratospheric ozone depletion, and global climate change.

The book contains numerous student examples and problems and over 200 color illustrations and photographs.

It may serve as an introductory textbook for a range of undergraduate and graduate courses on atmospheric pollution. It also provides information for researchers and an introduction to the subject of air pollution for general audiences.

2- Air Pollution and Global Warming: History, Science, and Solutions  
by Mark Z. Jacobson (Cambridge University Press, Cambridge, 2012)

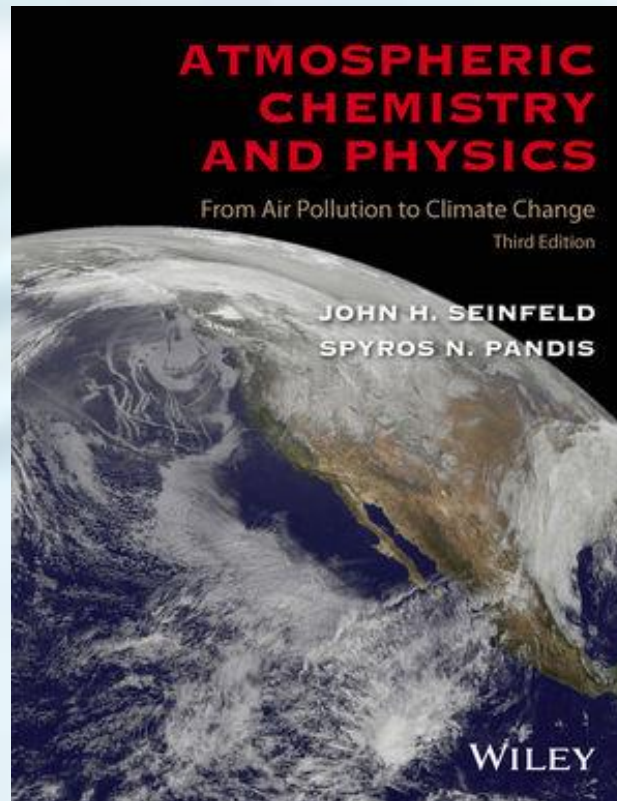


This book provides an introduction to the history, science, and solutions of local and global air pollution and global warming. It first introduces the history of discovery of chemicals in the air, then discusses the historic evolution of the Earth's atmosphere and the structure and composition of the present-day atmosphere. Subsequently, it examines historical, scientific, and regulatory aspects of five major air-related topics: urban outdoor air pollution, indoor air pollution, acid deposition, global stratospheric and Antarctic ozone reduction, and global warming. It also looks at the effects of meteorology on air pollution and vice-versa and the effects of pollution on visibility, ultraviolet radiation, and colors in the sky. A final chapter discusses large-scale renewable energy solutions to global warming and air pollution and technical and policy issues related to those solutions. The book contains 13 chapters, each with student examples and problems, 238 color illustrations and photographs, and 71 tables. It is an introductory text designed for general audiences and for a range of undergraduate and graduate courses on air pollution, climate, and the environment. Researchers can also find several previously unpublished figures and new compilations of information within it.

# 3- Atmospheric Chemistry and Physics

## From Air Pollution to Climate Change

John H. Seinfeld Spyros N. Pandis University, 2006





# Assessment

Providing Lecture - 20%

*Final exam: 80%*

# Definitions

**Atom.** Nucleus containing 1-92 positively-charged protons and 0-146 zero-charged neutrons surrounded by 1-92+ negatively charged electrons in orbit around it.

**Ion.** Atom with a different number of protons from electrons.

**Atomic mass.** Average mass of protons plus neutrons in the nucleus of an atom.

**Atomic number.** Number of protons in an atomic nucleus.



# Definitions

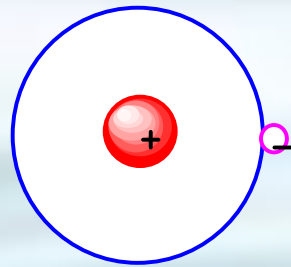
**Element.** Single atom or substance composed of several atoms, each with the same atomic number.

**Isotope.** Atoms of an element with a different number of neutrons in the nucleus (but same number of protons).

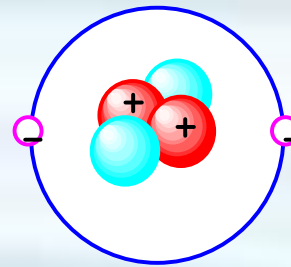
# Periodic Table of Elements

Element	Symbol	Number of Protons (Atomic Number)	Number of Neutrons in Main Isotope	Average Atomic Mass of Isotopes (g/mole)	Number of Electrons
Hydrogen	H	1	0	1.00794	1
Helium	He	2	2	4.00206	2
Carbon	C	6	6	12.011	6
Nitrogen	N	7	7	14.0067	7
Oxygen	O	8	8	15.9994	8

# Hydrogen and Helium



Hydrogen



Helium

## Definitions

**Gas.** Individual atoms or molecules suspended in the air in the gas phase.

**Particle.** Aggregate of atoms and/or molecules in the liquid and/or solid phase.

**Aerosol.** Ensemble of solid, liquid, or mixed-phase particles suspended in air.

**Aerosol particle.** A single liquid, solid, or mixed-phase particle among an ensemble of suspended particles.

## Definitions

**Hydrometeor.** Ensemble of solid, liquid, or mixed-phase particles containing primarily water.

**Hydrometeor particle.** A single particle among an ensemble of particles containing primarily water.



## Definition of Air Pollution

Buildup in the air of anthropogenically -emitted gases and/or aerosol particles in concentrations sufficiently high to cause damage to humans, plants, animals, other life forms, ecosystems, structures, or works of art.