

Fouling of Membrane and Thermal Units

A Unified Approach to Its Principles, Assessment, Control, and Mitigation

by Roya Sheikholeslami



This scholarly monograph authored by a leading fouling researcher reflects the immense advances in basic and applied aspects of fouling that have taken place over the last 40 years. Traditionally, engineers and scientists have been encouraged to develop their expertise in a specific area; hence very limited may have the experience of dealing with the same principles in completely different systems. As such indeed a very limited people have experience with fouling of differing process equipment such as membranes and heat exchangers. This fact often leads to exhaustive and unnecessary efforts as they attempt to reinvent the

wheel. It is therefore more constructive for design, mitigation and control to assess fouling in terms of its own principles and irrespective of the process unit in which it occurs. This book aims to combine and consolidate the principles upon which the fouling phenomenon is based instead of the processes in which it occurs and to highlight the similarities and differences that may exist in fouling of different types of process equipment including both membrane and thermal units and from both the fundamental and practical aspects. This monumental effort has been admirably tackled by the author. This book will no doubt help individuals to better understand, address, and mitigate the fouling problem and to accelerate progress in fouling research and development efforts.

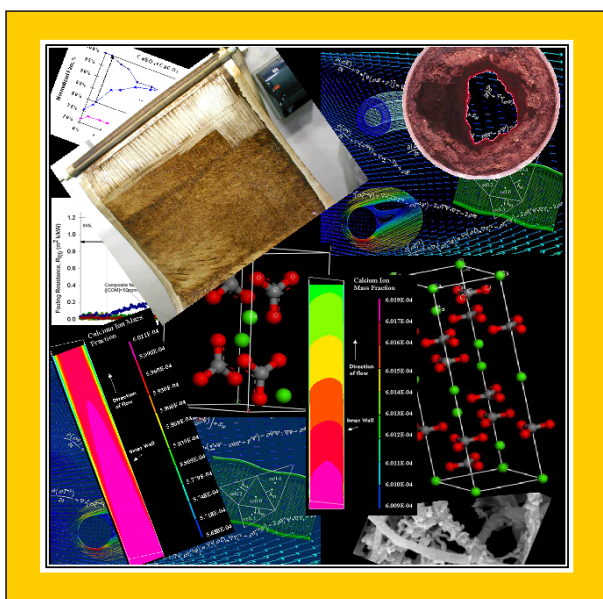


Table of Contents

Chapter 1. Introduction: General Overview

Chapter 2. General Description

- Fouling occurrences

 - Membranes

 - Heat exchangers

 - Similarities and differences

Chapter 3. Fundamentals and Models

- Mechanisms

 - Stages of fouling

 - Initiation

 - Transport

 - Attachment

 - Growth

 - Aging

 - Removal

 - Types of fouling

 - Crystallization fouling

 - Particulate fouling

 - Surface reaction (corrosion) fouling

 - Biological fouling

 - Chemical reaction fouling

 - Composite fouling

 - Crystallization and particulate fouling

 - Crystallization and surface reaction fouling

 - Particulate and surface reaction fouling

 - Composite inorganic and biological fouling

 - Inorganic and chemical reaction fouling

 - Biological and surface reaction fouling

 - Fouling by mixed salts

- Discussion of fouling curves and fouling resistance studies

- Physical characteristics of matter.

 - Surface tension and surface energy

 - Contact angle

 - Hydrophilicity, hydrophobicity and wettability

 - Surface charge

- Factors affecting fouling

 - Type of Foulant and its properties

 - Fluid and flow characteristics

 - Fluid properties

 - Concentrations

 - Flow hydrodynamics

 - Substratum (surface) characteristics

- Modelling of Fouling process

Chapter 4. Industrial Fouling

- Overview

- Occurrences

 - Aqueous media

 - Non-aqueous media

Chapter 5. Preventative Methods

- General considerations

- Preventative strategies

 - Operational strategies

 - Foulant and nutrient concentration

 - Use of chemical additives

 - Aqueous systems

 - Organic systems

 - Use of biocides and nutrient control

 - Mixed streams compatibility

 - Temperature

 - Pressure

 - pH

 - Flow condition and hydrodynamics

 - Process design, control, start-up and shut-down

 - Design strategies

 - Surface characteristics

 - Sizing and geometry

 - Emerging technologies

Chapter 6. Cleaning of Fouled Surfaces

- General considerations

- Cleaning methods

 - Chemical cleaning

 - Chemical agents

 - Solvents for organic-based deposits

 - Solvents for waterside deposits

 - On-line methods

Off-line Methods

 - Operating conditions and compatibility

 - Mechanical cleaning

 - On-line methods

 - Semi on-line methods

 - Off-line methods

Chapter 7. Future Directions

- Introduction

- Characterization of fouling propensity

 - Surface characteristics

 - Process feed characteristics

 - Flow hydrodynamics

- Conclusions

References

Index

PLEASE ENTER MY ORDER FOR

Fouling of Membrane and Thermal Units

A Unified Approach to Its Principles, Assessment, Control, and Mitigation

by *Roya Sheikholeslami*

ISBN 0-86689-066-1

Prepublication price €89 including shipping by air

Please send me ____ copy(ies) at €89 (or \$ equivalent) per copy

I enclose payment in the amount of € ____ by ☐ [Check](#)

[Credit card](#)

☐ Visa

☐ MasterCard

Card N° _____ Exp. date _____

Cardholder name _____ Signature _____

Name _____

Address _____

Country _____ Email _____

Telephone _____ Fax _____

Date _____

PLEASE SEND TO:

Miriam Balaban, Desalination Publications
Science and Technology Park of Abruzzo
Via Antica Arischia 1
67100 L'Aquila, Italy
Tel. +39 0862 319954, +39 348 3348406
Fax +39 0862 320 434
email: balaban@desline.com
miriambalaban@yahoo.com

PAYMENT BY [BANK TRANSFER](#) TO:

Please take care of your own bank charges
Account name: Miriam Balaban
Account No. 10849.36
Banca Monte dei Paschi di Siena
67100 L'Aquila, Italy
ABI: 01030 *CAB:* 03600
Swift code: PASCITMMAQU
IBAN code: IT 16N 01030 03600 000001 084936