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Nota di contenuto	Front Cover; Multiscale Modeling for Process Safety Applications; Copyright; Contents; Preface; Acknowledgments; 1 - INTRODUCTION; REFERENCES; 2 - PROCESS SAFETY; 2.1 FIRE; 2.1.1 THE FIRE TRIANGLE; 2.1.2 IGNITION PHENOMENA; 2.1.3 FLAMMABILITY LIMITS OF GASES AND VAPORS; 2.1.4 TYPES OF FIRES; 2.1.4.1 Diffusion fires; Jet fires; Natural fires; Pool fires; Fireballs; 2.1.4.2 Premixed fires; Flash fires; 2.1.5 FIRE RISK ANALYSIS; 2.2 EXPLOSION; 2.2.1 DEFLAGRATION AND DETONATION; 2.2.2 EXPLOSION ENERGY; 2.2.2.1 Energy of chemical explosions; 2.2.2.2 Energy of mechanical explosions Brode's equation (Brode, 1959)Isentropic expansion; Isothermal expansion; Thermodynamic availability; 2.2.3 EXPLOSION TYPES; 2.2.3.1 Vapor cloud explosion; 2.2.3.2 Boiling liquid expanding vapor explosion; 2.2.3.3 Dust explosion; Explosibility classification; Minimum ignition temperature; Minimum explosive concentration; Minimum ignition energy; Explosion pressure characteristics; 2.2.4 EXPLOSION PREVENTION; 2.2.4.1 Inerting; Vacuum purging; Pressure purging; Combined pressure-vacuum purging; Sweep-through purging; 2.2.4.2 Controlling static electricity; 2.2.4.3 Ventilation; 2.3 TOXIC EFFECTS 2.3.1 HOW TOXIC SUBSTANCES ENTER THE ORGANISM2.3.2 PARTICLE CLASSIFICATION; 2.3.2.1 Dimensionality; 2.3.2.2 Particle morphology; 2.3.2.3 Particle composition; 2.3.2.4 Particle uniformity and agglomeration; 2.3.3 TOXIC SUBSTANCES; 2.3.4 TOXICITY ASSESSMENT;

2.3.4.1 Noncancer effect; 2.3.4.2 Cancer effect; 2.3.5 RISK ASSESSMENT; 2.3.6 HYGIENE STANDARDS; 2.3.6.1 ERPG; 2.3.6.2 IDLH; 2.3.6.3 EEGL; 2.3.6.4 PEL; 2.3.6.5 TXDS; 2.3.6.6 RMP; 2.3.7 HAZARD ASSESSMENT METHODOLOGY; 2.3.8 SOURCE TERM; 2.3.9 GAS DISPERSION; 2.3.9.1 Workbooks/correlations; 2.3.9.2 Integral models; 2.3.9.3 Shallow layer models
2.3.9.4 Computational fluid dynamics2.3.10 CONCENTRATION FLUCTUATIONS; 2.3.11 MITIGATION: TERRAIN, BARRIERS, SPRAYS, SHELTER, AND EVACUATION; 2.3.12 PLANT LAYOUT; 2.3.13 COMPUTER AIDS; 2.4 PRESENT APPROACH TO PROCESS SAFETY; 2.4.1 RISK AND HAZARD; 2.4.2 METHODOLOGY IN RISK ASSESSMENT; 2.4.2.1 Nodes in risk assessment; 2.4.2.2 Teams and information required for a risk assessment; 2.4.3 QUANTITATIVE RISK ASSESSMENT; 2.4.4 SCALABILITY IN RISK ASSESSMENT METHODOLOGIES; 2.4.5 PROBABILITY BASED APPROACHES; 2.4.5.1 Fault tree analysis; 2.4.5.2 Event tree analysis; 2.4.5.3 Bow-tie plots
2.4.5.4 Failure modes and effects analysis2.4.5.5 Bayesian networks; 2.4.6 CONSEQUENCE-BASED APPROACHES; 2.4.6.1 Fire consequence modeling; Impact on personnel; Impact on structures; Impact on Electrical Equipment; Impact on the environment; 2.4.6.2 Probit analysis: dose-response modeling; 2.4.7 QUALITATIVE AND SEMI-QUANTITATIVE APPROACHES; 2.4.7.1 Layer of protection analysis; 2.4.7.2 Risk matrix; 2.4.7.3 HAZOP; 2.4.7.4 What-if analysis; 2.4.7.5 Checklist; 2.4.7.6 What-if/checklist; 2.4.7.7 Dow fire and explosion index; 2.5 PROCESS SAFETY CHALLENGES AND LOOKING AT THE FUTURE
2.5.1 INTRODUCTION

Sommario/riassunto

Multiscale Modeling for Process Safety Applications is a new reference demonstrating the implementation of multiscale modeling techniques on process safety applications. It is a valuable resource for readers interested in theoretical simulations and/or computer simulations of hazardous scenarios. As multi-scale modeling is a computational technique for solving problems involving multiple scales, such as how a flammable vapor cloud might behave if ignited, this book provides information on the fundamental topics of toxic, fire, and air explosion modeling, as well as modeling jet and pool fires using computational fluid dynamics. The book goes on to cover nanomaterial toxicity, QPSR analysis on relation of chemical structure to flash point, molecular structure and burning velocity, first principle studies of reactive chemicals, water and air reactive chemicals, and dust explosions. Chemical and process safety professionals, as well as faculty and graduate researchers, will benefit from the detailed coverage provided in this book. Provides the only comprehensive source addressing the use of multiscale modeling in the context of process safety Bridges multiscale modeling with process safety, enabling the reader to understand mapping between problem detail and effective usage of resources Presents an overall picture of addressing safety problems in all levels of modeling and the latest approaches to each in the field Features worked out examples, case studies, and a question bank to aid understanding and involvement for the reader

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