

Thermochem and Collision theory Study Guide

What is enthalpy? (define it and indicate its symbol)

heat content of a reaction or process. H

What is thermochemistry?

Study of heat (E) changes of a reaction

What is an exothermic reaction?

a reaction that gives off heat

Explain why an exothermic reaction have a negative enthalpy change?

b/c reactants lose heat to become products. (The overall ΔH is negative)

What is an endothermic reaction?

a reaction that absorbs heat

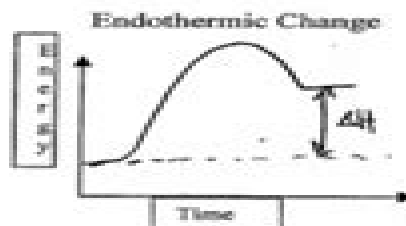
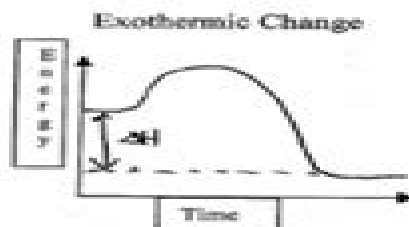
Explain why an endothermic reaction have a positive enthalpy change?

b/c reactants absorb heat to become products (The overall ΔH is +)

Complete the following chart:

Type of Reaction	Sign of ΔH_{rxn}	Which has more energy: reactants or products?	What temperature change would you see?
Exothermic	-	Reactants	Temp would $\uparrow$
Endothermic	+	Products	Temp. would $\downarrow$

Make enthalpy diagrams for the two chemical reactions from above, showing clearly the amount of energy released or gained.



Does the energy go from the surrounding to the chemicals or from the chemicals to the surroundings in an exothermic reaction? from chemicals to surroundings

Does the energy go from the surrounding to the chemicals or from the chemicals to the surroundings in an endothermic reaction? from surroundings to chemicals

Classify each of the following as an exothermic or endothermic process.

Melting ice cubes endothermic

Burning a candle exothermic

Evaporation of water endothermic

Baking Bread endothermic

Splitting a gas molecule apart endothermic (breaking bond!)

Formation of snow in clouds exothermic (freezing!)

What type of reactions are the following based on the enthalpy?

$C + H_2O \rightarrow CO + H_2$ $\Delta H_{rxn} = +113 \text{ kJ}$ endothermic

$2H_2O_2 \rightarrow 2H_2O + O_2$ $\Delta H = -190 \text{ kJ}$ exothermic

$6CO_2 + 6H_2O + 2803 \text{ kJ} \rightarrow C_6H_{12}O_6 + 6O_2$ endothermic

$3NO_2 + H_2O \rightarrow 2HNO_3 + NO + 138 \text{ kJ}$ exothermic

$P_4 + 5O_2 \rightarrow 3013 \text{ kJ} + P_4O_{10}$ exothermic

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Fundamentals of Engineering Thermodynamics Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, 2010-12-07 This leading text in the field maintains its engaging readable style while presenting a broader range of applications that motivate engineers to learn the core thermodynamics concepts Two new coauthors help update the material and integrate engaging new problems Throughout the chapters they focus on the relevance of thermodynamics to modern engineering problems Many relevant engineering based situations are also presented to help engineers model and solve these problems

Study Guide and Solutions Manual Neil E. Schore, 2002-08-02

Computational Thermo-kinetics of Rigid Polyurethane Foams Arnold A. Lubguban, Arnold C. Alguno, Roberto M. Malaluan, Gerard G. Dumancas, 2025-02-25 This book presents a detailed exploration of advanced computational modeling techniques in the design testing and applications of rigid polyurethane foams RPUFs By leveraging modern approaches such as database driven predictions iterative simulations and emerging innovations in computational material engineering it offers a more accurate and efficient way to model the thermo kinetic behavior of RPUFs The necessity for computational tools in materials science is intertwined with the growth of the polyurethane market with many academic and industrial researchers seeking to adopt these methods The book comprehensively discusses the advancement in bridging the gap between traditional empirical methods and cutting edge computational techniques specifically applied to RPUFs Furthermore it is a comprehensive guide to the computational modeling of the thermo kinetics of RPUFs making it an essential resource for researchers engineers and academicians seeking to innovate in material science and engineering This book addresses a niche yet critical area within this broader scope

Journal of Research of the National Bureau of Standards United States. National Bureau of Standards, 1988

Springer Handbook of Glass J. David Musgraves, Juejun Hu, Laurent Calvez, 2019-11-08 This handbook provides comprehensive treatment of the current state of glass science from the leading experts in the field Opening with an enlightening contribution on the history of glass the volume is then divided

into eight parts The first part covers fundamental properties from the current understanding of the thermodynamics of the amorphous state kinetics and linear and nonlinear optical properties through colors photosensitivity and chemical durability The second part provides dedicated chapters on each individual glass type covering traditional systems like silicates and other oxide systems as well as novel hybrid amorphous materials and spin glasses The third part features detailed descriptions of modern characterization techniques for understanding this complex state of matter The fourth part covers modeling from first principles calculations through molecular dynamics simulations and statistical modeling The fifth part presents a range of laboratory and industrial glass processing methods The remaining parts cover a wide and representative range of applications areas from optics and photonics through environment energy architecture and sensing Written by the leading international experts in the field the Springer Handbook of Glass represents an invaluable resource for graduate students through academic and industry researchers working in photonics optoelectronics materials science energy architecture and more

Recent Trends in Applied Physics and Material Science Sudhir Bhardwaj, Manoj Singh Shekhawat, Bhuvneshwer Suthar, 2025-10-22 It gives us immense pleasure to present the Conference Proceedings of the Second International Conference on Recent Trends in Applied Physics Material Science RAM 2024 held on November 15 16 2024 at Bikaner Rajasthan India This prestigious event was organized jointly by Bikaner Technical University Bikaner and the Condensed Matter Research Society Bikaner with the support of our esteemed publication partners CRC Press and the Journal of Condensed Matter RAM 2024 brought together over 400 participants both offline and online from across the globe reflecting the vibrant and growing international interest in the domains of Applied Physics and Material Science The conference featured plenary and keynote lectures by eminent experts oral presentations and poster sessions providing a stimulating platform for the exchange of knowledge and recent advances in the field

Thermodynamics Earl Logan, 1999 Examining practical hands on applications in large scale industrial settings this work covers the principles of the science of thermodynamics It presents applications for power plants refrigeration and air conditioning systems and turbomachinery Solutions manual available

Research in Interactive Design (Vol. 3) Jean-Pierre Nadeau, Xavier Fischer, 2011-04-23 This book provides an accurate overview of the recent research or industrial application in interactive design The different arguments taken from the international conference Virtual Concept 2005 will provide the reader with some advanced solutions concerning new methods and tools by discussing modelling techniques design solution space exploration and interactive process organization

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and technical decision making Together these will continue to transform batteries for electric vehicles This collection of nine papers presents the modeling and simulation of batteries and the continuing contribution being made to this impressive progress including topics that cover Thermal behavior and characteristics Battery management system design and analysis Moderately high fidelity 3D capabilities Optimization Techniques and Durability As electric vehicles continue to gain interest from manufacturers and consumers alike improvements in economy and affordability as well as adoption of alternative fuel sources to meet government mandates are driving battery research and development Progress in modeling and simulation will continue to contribute to battery improvements that deliver increased power energy storage and durability to further enhance the appeal of electric vehicles

Introduction to Thermal Systems Engineering Michael J. Moran, Howard N. Shapiro, Bruce R. Munson, David P. DeWitt, 2002-09-17 Ein Überblick über technische Aspekte thermischer Systeme In einem Band besprochen werden Thermodynamik Strömungslehre und Wärmetransport ein Standardwerk auf diesem Gebiet stützt sich auf die bewährtesten Lehrbücher der einzelnen Teilgebiete Moran Munson Incropera führt strukturierte Ansätze zur Problemlösung ein diskutiert Anwendungen die für Ingenieure verschiedenster Fachrichtungen von Interesse sind

The Future of Heritage Science and Technologies Rocco Furferi, Kate Seymour, Anna Pelagotti, 2025-05-03 This book features selected contributions from Florence Heri Tech 2024 showcasing cutting edge technologies for the analysis conservation and restoration of cultural heritage It explores advancements in materials science including nanotechnology and plasma based restoration as well as innovative diagnostic methods The book provides insights into biotechnology tailored materials and novel physical techniques offering a comprehensive overview of emerging trends in heritage preservation

Modeling the Material Behavior under Metal Cutting Conditions Marvin Hardt, 2022-03-16 The scientific goal of the present work was to model the workpiece material behavior of steels in the metal cutting process depending on the occurring thermo mechanical loads The results of this work shall make a significant contribution to the predictive process design of the cutting process by means of Finite Element FE simulations for the virtual representation of the reality in the sense of the digital twin To achieve the objective extensive empirical examinations were conducted in a first step which included conventional material scientific and orthogonal cutting tests This enabled the establishment of a database of the workpiece response with increasing thermo mechanical loads During the orthogonal cutting examinations integral and locally resolved process results were measured which were used as calibration and validation variables in the modeling of the workpiece material behavior By extending an established friction test bench with a workpiece pre heating system the friction conditions between tool and workpiece could be investigated under conditions equivalent to the cutting process Based on the experimental results a friction model was derived in which the observed effects of thermal softening and the localized adhesion induced increase in the apparent friction coefficient were superposed A phenomenological material model was developed to describe the workpiece material behavior in the cutting process The formulation of the material model was developed based on empirical

examinations as well as results from the state of the art The material model was implemented in an FE chip formation simulation using a subroutine A hybrid optimization algorithm was developed to inversely determine the material model parameters By means of the optimization algorithm the material model parameters could be systematically determined inversely taking the experimentally determined process observables into account An automated procedure linked to a user interface lowered the entry hurdle for industrial companies and unexperienced users of FE simulations and reduced the computational effort for the inverse parameter determination to about 10 days of computational execution time The quality of the developed models and the determined model parameters were further verified by a final deduction step using the industrial example of face turning

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