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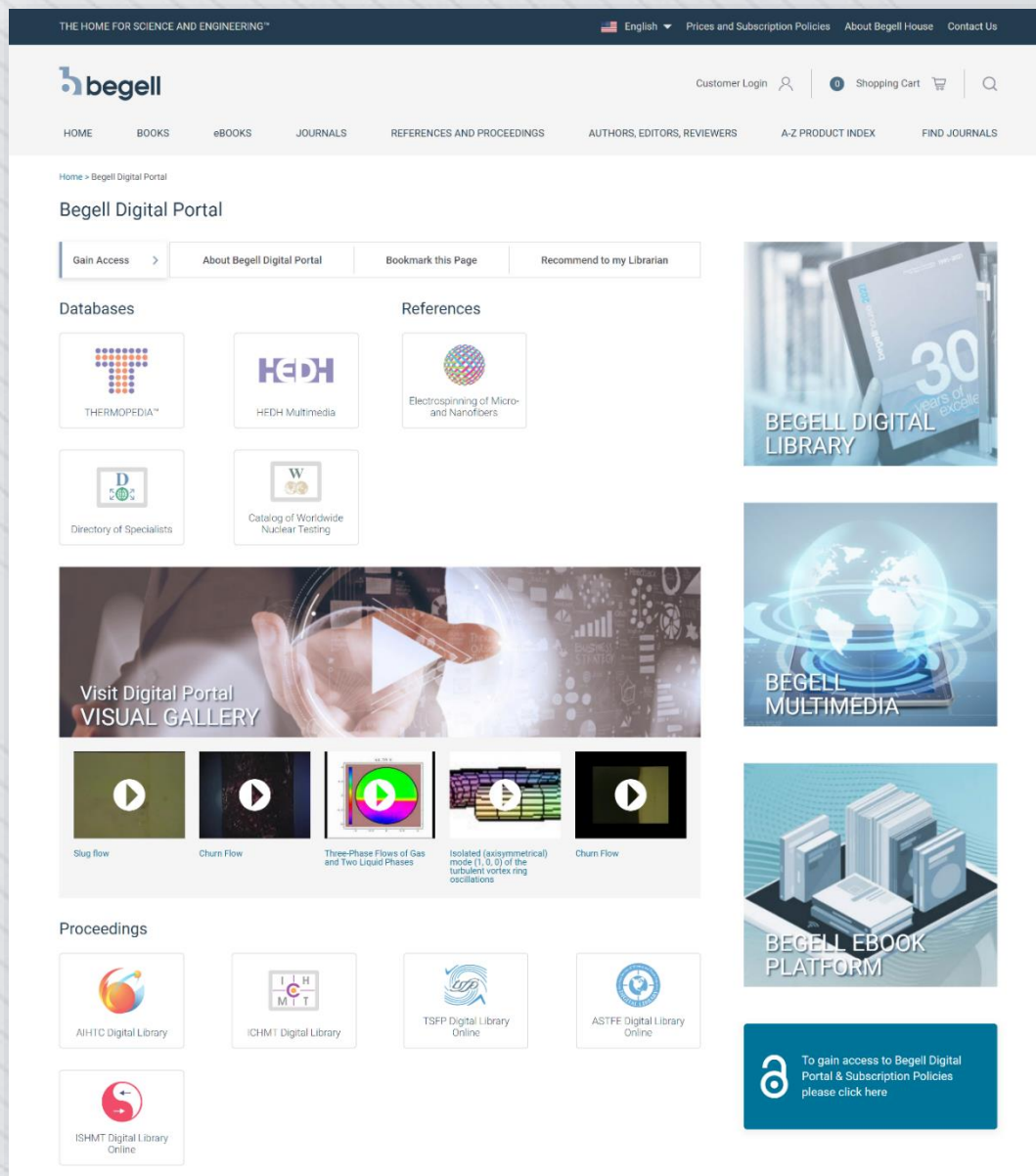
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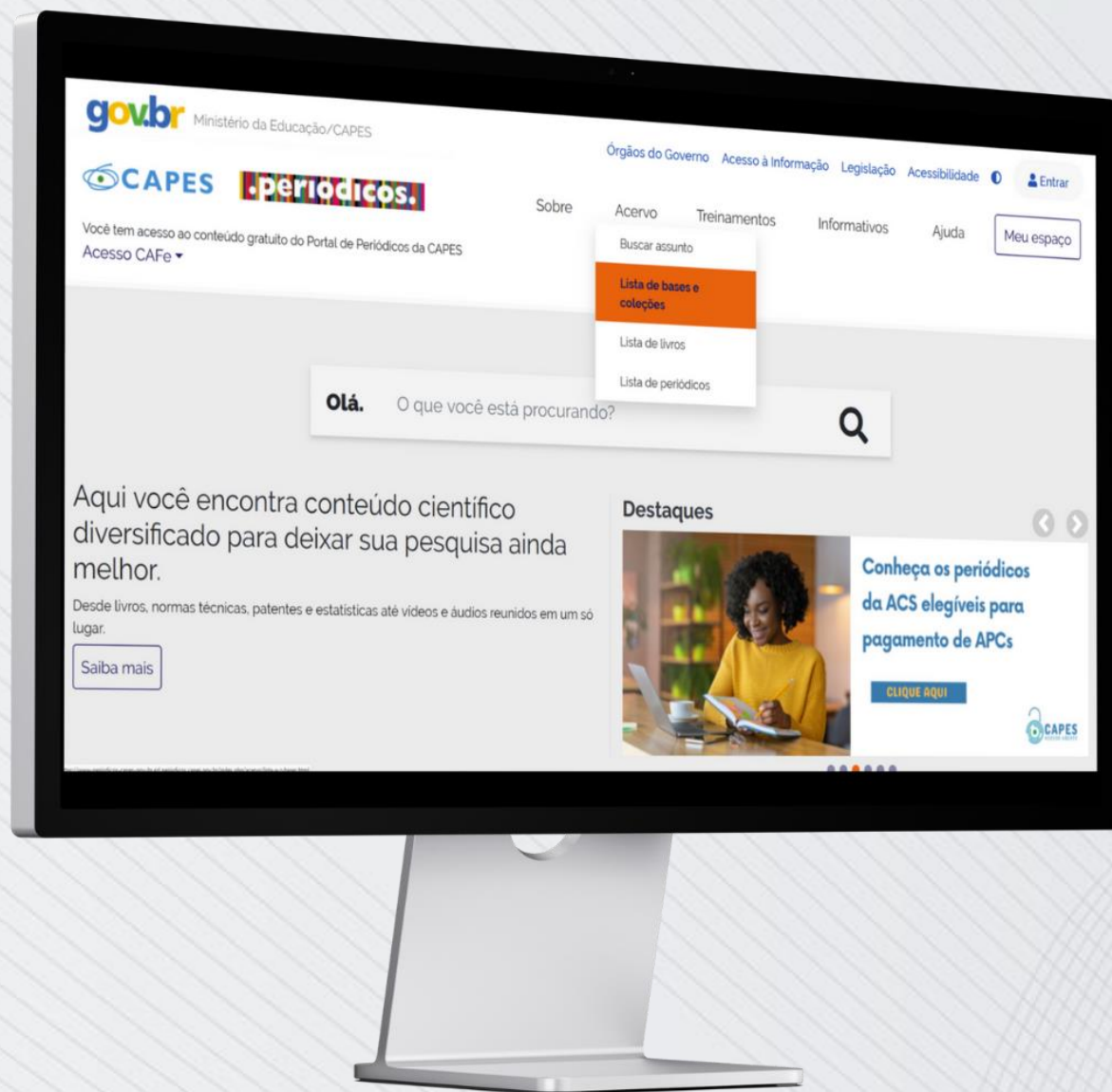
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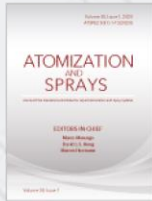
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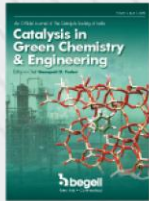
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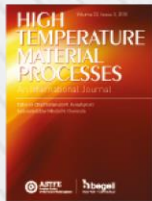
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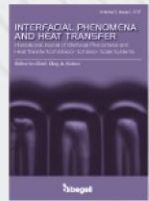
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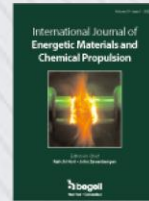
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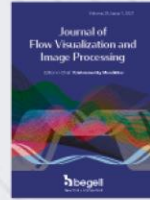
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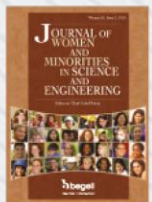
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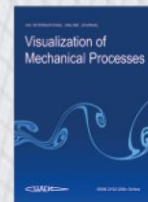
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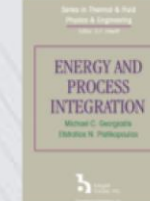


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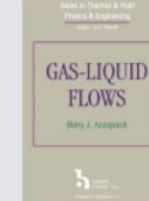


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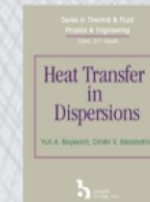
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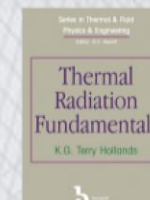
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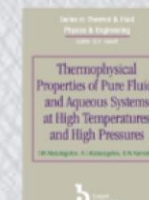
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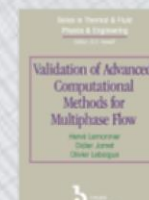
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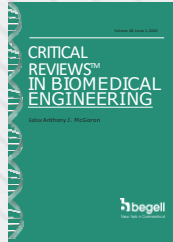
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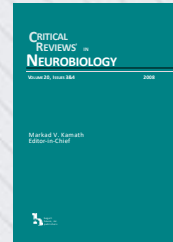
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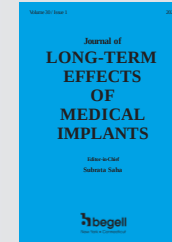
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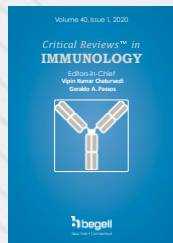
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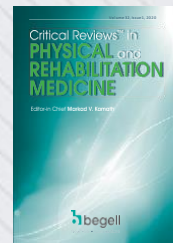
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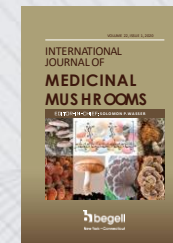
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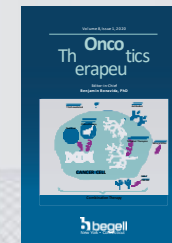
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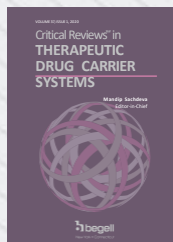
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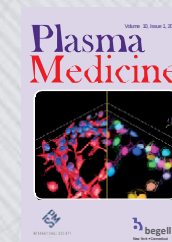
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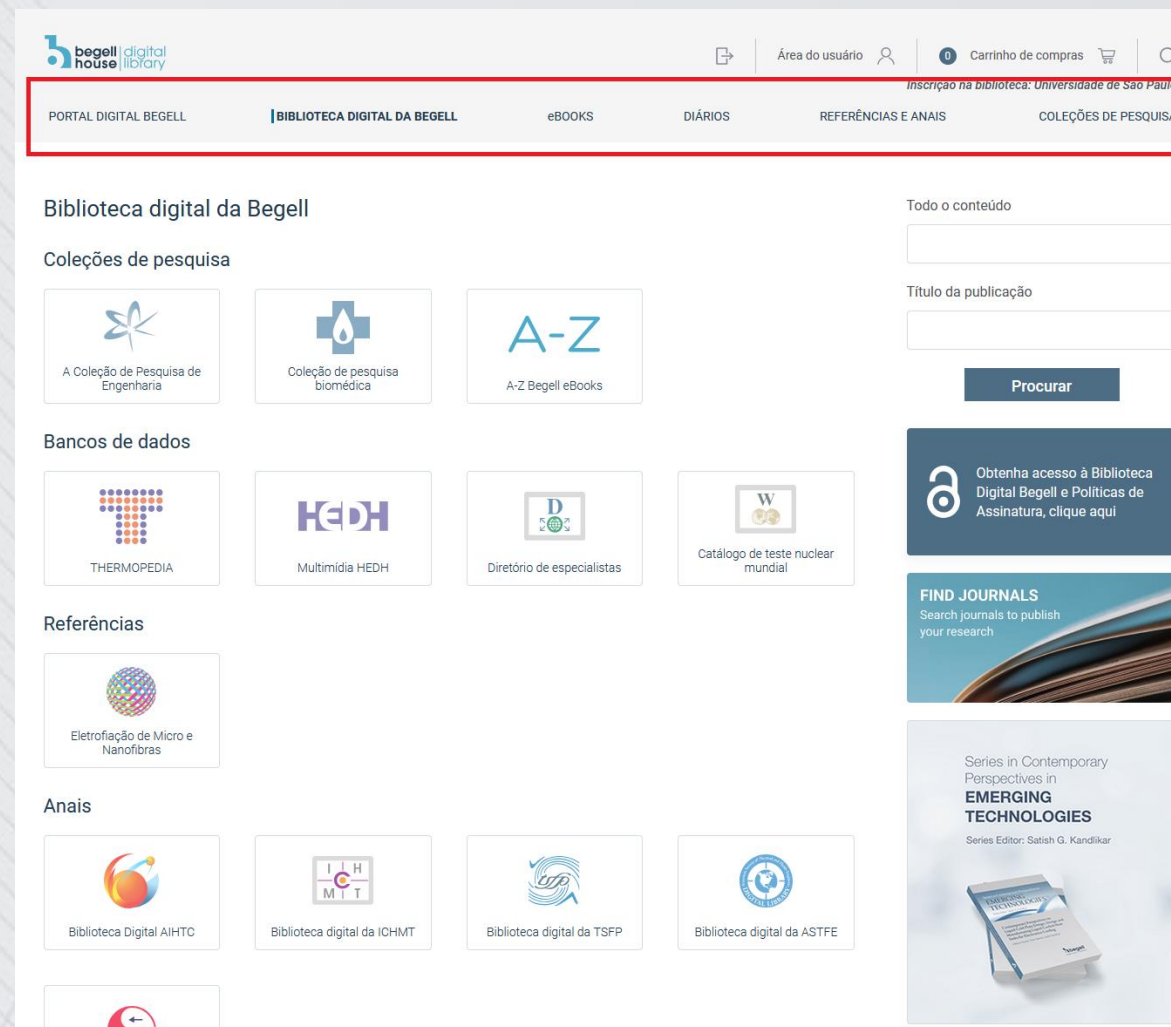
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Article of journal "International Journal of Energy for a Clean Environment" | [Troviano Mauricio](#); [Oggier Germán G.](#) | 2024

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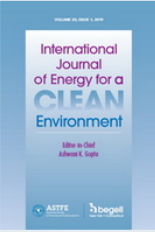


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LOW-COST PHOTOVOLTAIC EMULATOR WITH A HIGH-DYNAMIC RESPONSE FOR SMALL SATELLITE APPLICATIONS

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Mauricio Troviano (Corresponding author metroviano@gmail.com)
Departamento de Electrotecnia (FAIN-UNCo) e Instituto de Investigación y Desarrollo en Ingeniería de Procesos, Biotecnología y Energías Alternativas (PROBIEN, CONICET-UNCo), Neuquén, 8300, Argentina

Germán G. Oggier
Grupo de Electrónica Aplicada (GEA) / Instituto de Investigaciones en Tecnologías Energéticas y Materiales Avanzados (IITEMA), Universidad Nacional de Río Cuarto (UNRC), CONICET, Río Cuarto, Córdoba, X5804BYA, Argentina

RESUMO

In recent years, growing interest from academic institutions and emerging countries in small satellite missions has led to a need for photovoltaic emulators (PVEs) during subsystem testing. Unfortunately, the market lacks suitable PVEs with adequate power and characteristics for these applications. To fill this gap, this proposal introduces a low-cost, flexible, and reliable PVE for testing small satellite subsystems. The proposed PVE includes an analog electronic circuit that simulates the I-V curve from a space reference solar cell. It is characterized by its ability to operate under various conditions, achieving a maximum output power of 124 W. This makes it suitable for application scenarios with rapidly changing climatic conditions. The emulator's remarkable flexibility is demonstrated through the use of various solar cell technologies for space applications as references. Experimental results effectively confirm the practical feasibility of the proposed PVE.

Palavras-chave: photovoltaic emulator, space solar cells, small satellite development, Space Solar Array Simulator

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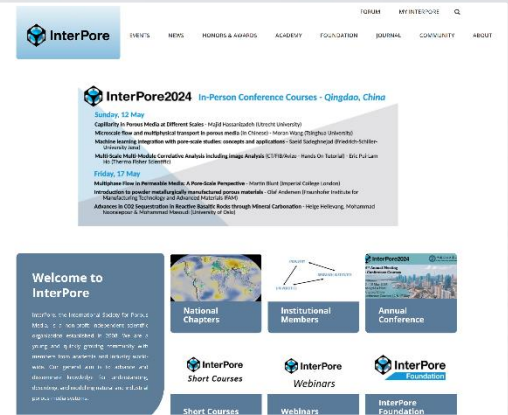
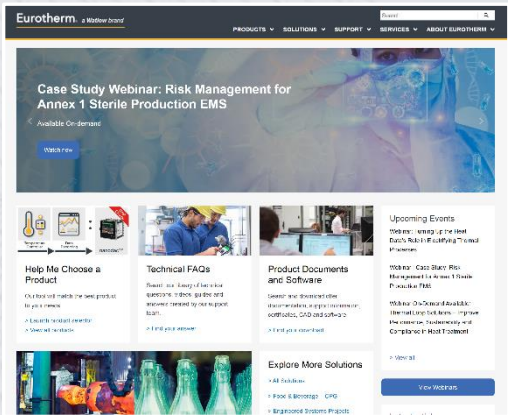
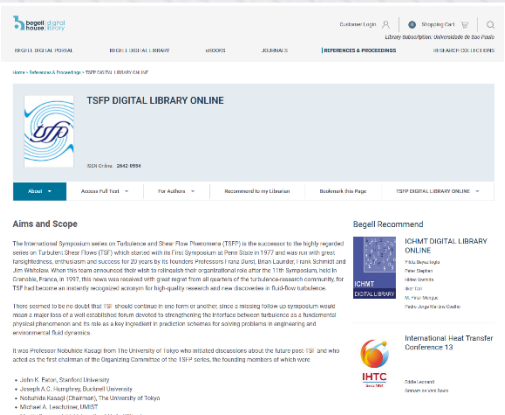
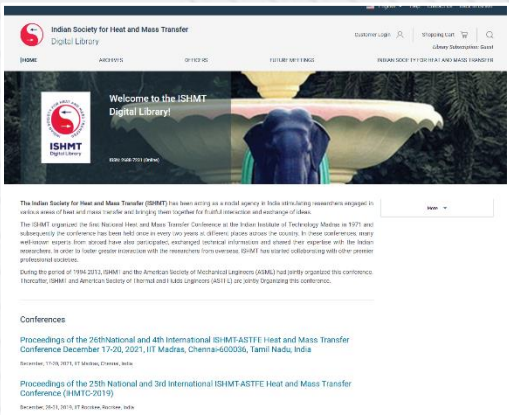
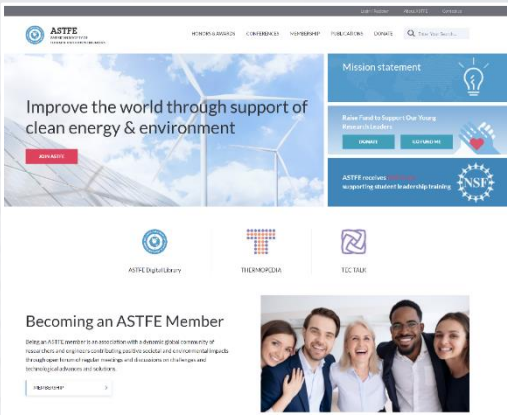
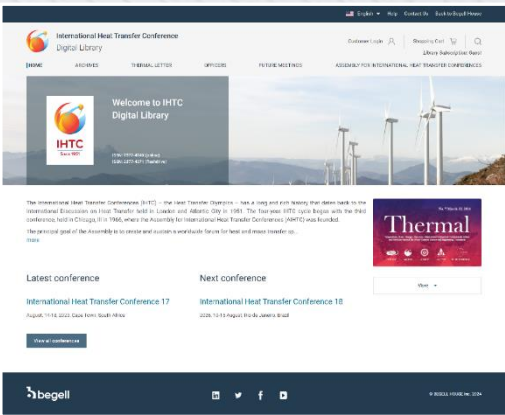
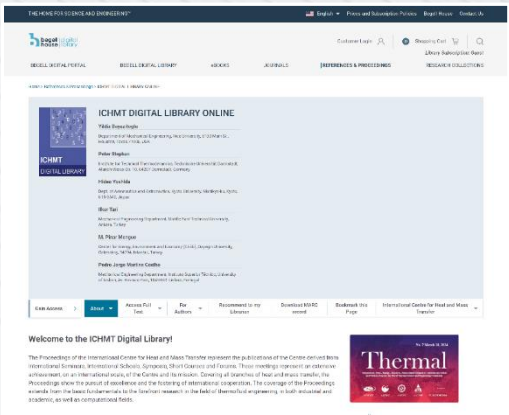
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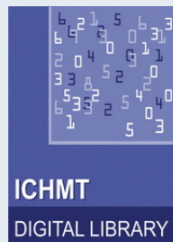
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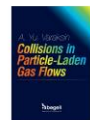
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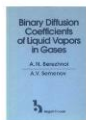
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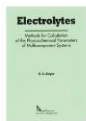
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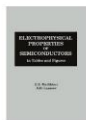
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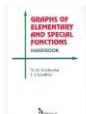
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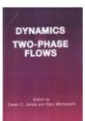
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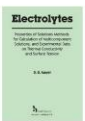
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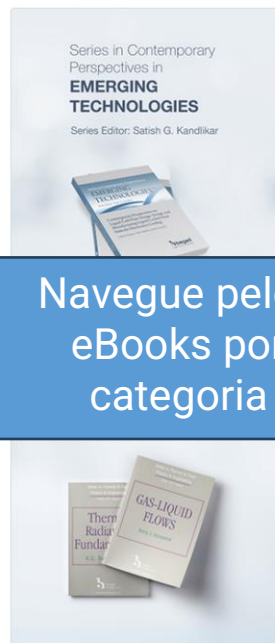
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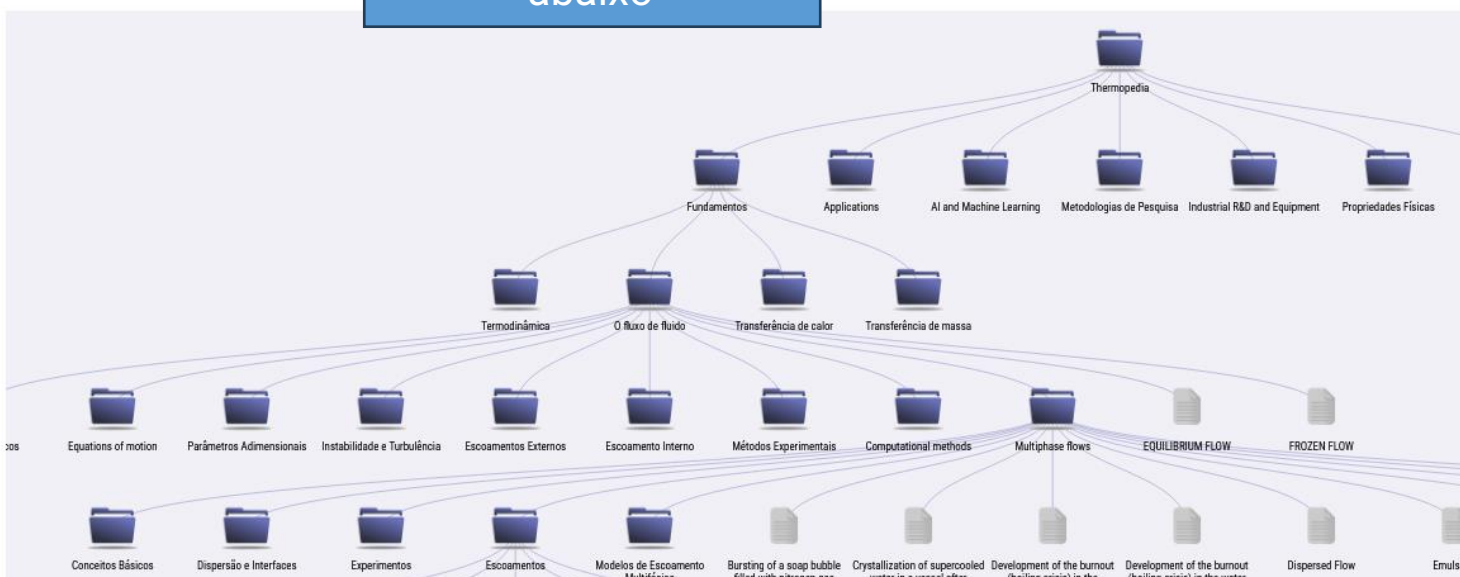
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Mapa semântico

Procure os termos de A a Z ou use o mapa de conteúdo abaixo

Temas

- Thermopedia
- Fundamentos
 - Termodinâmica
 - O fluxo de fluido
 - Conceitos Básicos
 - Equations of motion
 - Parâmetros Adimensionais



```

graph TD
    Thermopedia --> Fundamentos
    Thermopedia --> Applications
    Thermopedia --> AI[AI and Machine Learning]
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    Thermopedia --> Industrial[Industrial R&D and Equipment]
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    Fundamentos --> Termodinamica[Termodinâmica]
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    Fundamentos --> TransferenciaCalor[Transferência de calor]
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    Termodinamica --> Instabilidade[Instabilidade e Turbulência]
    Termodinamica --> EscoamentosExternos[Escoamentos Externos]
    Termodinamica --> EscoamentoInterno[Escoamento Interno]
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    Fluxo --> ConceitosBasicos[Conceitos Básicos]
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    Fluxo --> Experimentos[Experimentos]
    Fluxo --> Escoamentos[Escoamentos]
    Fluxo --> Modelos[Modelos de Escoamento Multifásico]
    
    TransferenciaCalor --> Bubbles[Bursting of a soap bubble filled with nitrogen gas]
    TransferenciaCalor --> Crystallization[Crystallization of supercooled water in a vessel after mechanical action]
    TransferenciaCalor --> BurnoutDegassed[Development of the burnout (boiling crisis) in the degassed water]
    TransferenciaCalor --> BurnoutSaturated[Development of the burnout (boiling crisis) in the water saturated with gas]
    
    TransferenciaMassa --> Multiphase[Multiphase flows]
    TransferenciaMassa --> Equilibrium[EQUILIBRIUM FLOW]
    TransferenciaMassa --> Frozen[FROZEN FLOW]
    TransferenciaMassa --> Dispersed[Dispersed Flow]
    TransferenciaMassa --> Emulsion[Emulsion]
  
```

Gas-Liquid Flow

Hewitt, Geoffrey F. | DOI: [10.1615/AtoZ.g.gas-liquid_flow](https://doi.org/10.1615/AtoZ.g.gas-liquid_flow)

Article added: 7 September 2010 | Article last modified: 25 May 2011



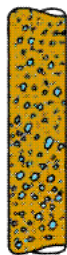
VIEW IN SEMANTIC MAP

A-Z

VIEW IN A-Z INDEX

Of the four type of **Two-Phase Flow** (Gas-Liquid, Gas-Solid, Liquid-Liquid and Liquid-Solid), gas-liquid flows are the most common characteristics of a deformable interface and the compressibility of one of the phases. For given flows of the two phases in a interfacial distribution can take any of an infinite number of possible forms. However, these forms can be classified into types commonly called *flow regimes* or *flow patterns*. Detailed discussions of these patterns are given by Hewitt (1982), Whalley (1987). The regimes encountered in vertical flows are illustrated in Figure 1. They include **Bubble Flow**, where the liquid is continuous bubbles within the liquid; **Slug or Plug Flow** where the bubbles have coalesced to make larger bubbles which approach the diameter of the pipe; **Churn Flow** where the slug flow bubbles have broken down to give oscillating churn regime; **Annular Flow** where the liquid flows on the wall of the pipe and the gas flows in the centre (the liquid is entrained in the core) and the gas flows in the centre; and **Wispy Annular Flow** where, as the liquid flow rate is increased, the gas core increases, leading to the formation of large lumps or streaks (wisps) of liquid.

Hyperlinks to references and related articles (orange)



Bubble Flow () Slug or Plug Flow () Churn Flow () Annular Flow () Wispy Annular Flow ()

Figure 1. Flow patterns in vertical flow (All Flows ).

Flow regimes in horizontal flow are illustrated in Figure 2. Here, as gravity acts normally to flow direction, separation of the flow occurs. The respective



THERMOPEDIA

Procurar

INSCRIÇÃO NA BIBLIOTECA: GUEST

ÍNDICE A-Z AUTORES / EDITORES MAPA SEMÂNTICO GALERIA VISUAL CONTRIBUIÇÃO

Galeria Visual

Temas
NUMB

-  Aplicações
-  Métodos Computacionais
-  Técnicas Experimentais
-  Fundamentos
-  Conteúdo Interdisciplinar

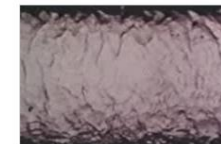
Tópicos

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Programas

- SISTEMAS DE ENERGIA AVANÇADOS

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Annular Dispersed Flow



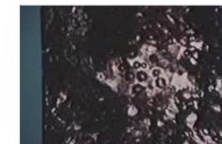
Annular Flow



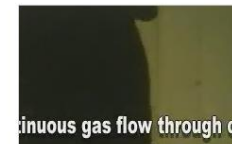
Bottom Flooding



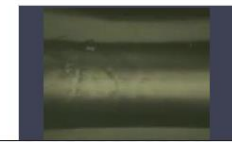
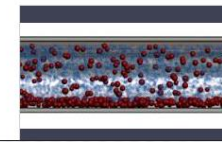
Bubble Flow



Churn Flow



Churn Flow



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relacionados

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Fundamentals

Modes of Heat Transfer

Foam Systems

Heat Exchanger Design Theory

Microchannels

Boiling and Evaporation

Drag Reduction

Fouling in Heat Exchangers

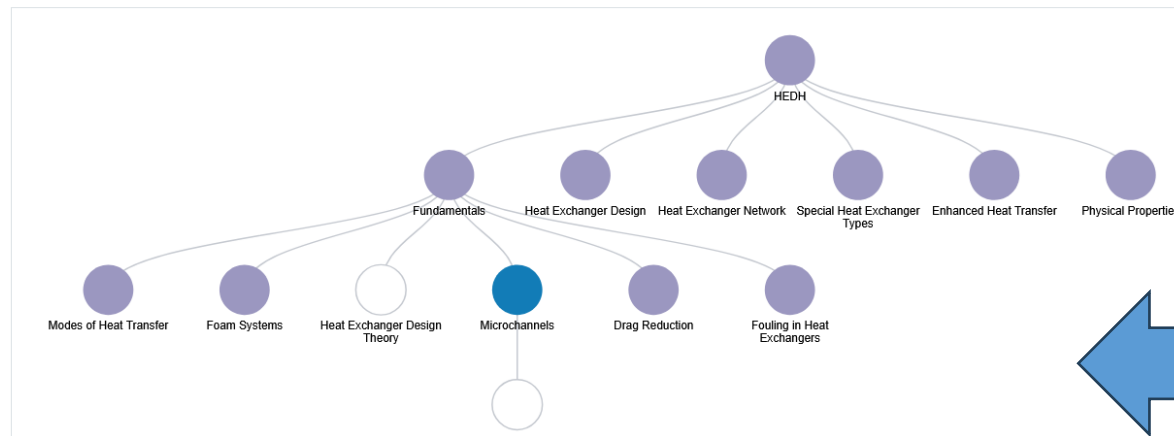
Heat Exchanger Design

Heat Exchanger Network

Special Heat Exchanger Types

Enhanced Heat Transfer

Physical Properties



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subtópicos e
termos
relacionados

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Fundamentals > Microchannels

Boiling and Evaporation

DOI 10.1615/hedhme.a.000228

Sujoy Kumar Saha and Gian Piero Celata

A. Introduction

Microcooling elements in micro-thermal-mechanical systems (MTMS) are a modern high-end technology. Microchannel heat sinks are extensively used in high-heat flux systems, e.g., microelectronic, optical and microfluidic devices, high-performance superlaser devices, very high temperature gas-cooled reactors and liquid metal fast reactors, radiator panels of spacecraft, thermal control of satellites, etc. In pharmaceutical and chemical industries, by integrating heat exchangers, mixers, and reactors as a decrease in the system size. Heat exchangers based on microscale channels are used in automotive fuel cells where the heat dissipation system should be compact and contain a minimum number of components. The heat dissipation rate is extremely high and very important in such devices due to possible higher heat transfer coefficients and much lower temperature gradients along the heat exchanger. In addition, two-phase microchannel heat sinks are one of the strongest candidates for heat removal devices in high power ratio, compact dimensions, and low flow rate requirements. Flow boiling in microchannels has drawn considerable attention from researchers worldwide. Microchannels are used in MEMS and high-end microprocessor cooling applications. Microchannels (up to 600 bar) and temperatures (1,000 °C). There is a scale effect that becomes evident when the hydraulic diameter is less than the capillary length, i.e., $[(\sigma g / (\rho_l - \rho_v))^{0.5}]$.

On microchannels, the hydraulic diameter of the channels is smaller than the capillary length. Identifying the threshold, or the transition band, beyond which a two-phase flow may be considered "micro" is an open issue. The channel classification has been given by many researchers, but it is not clear which one should be used as a mere guide indicating the size range, rather than rigid demarcations based on specific criteria. Relevant literature in this direction would be [Kawaji and Chung \(2003\)](#). The confinement number (Co), as the distinguishing parameter, gives only a rough

Suo and Griffith (1964) set $Co_{th} = 3.3$, and Kew and Cornwell (1997) suggest $1e-4 \text{ mm}^{-0.5}$, whereas that suggested by Brauner and Moalem Maron (1992) is 0.16.

Two sets of classifications based on the hydraulic diameter were given by [Mehendale et al. \(2000a\)](#) and [Kandlikar et al. \(2001\)](#). According to [Mehendale et al. \(2000a\)](#), a microchannel is 1–100 μm , mesochannel 100 μm –1 mm, compact passages 1–6 mm, and conventional channels >6 mm. According to [Kandlikar et al. \(2001\)](#), a molecular nanochannel is <0.1 μm , transitional nanochannel 0.1–1 μm , transitional microchannel 1–10 μm , microchannel 10–200 μm , minichannels 200 μm –3 mm, and conventional channels >3 mm.

A more general definition would have to address situations where classical theory is no longer fully applicable, that is, it no longer correctly predicts the mechanical and thermal process in terms of friction and heat transfer. The definition also depends on the fluid and the working conditions.

Feng and Serizawa (2000) define a microchannel as being one in which the Laplace constant is larger than the diameter of the channel. They categorized their observations of flow regimes as follows: bubble flow, elongated bubble (or slug) flow, annular flow, liquid ring flow, liquid lump flow, and mist flow.

Another criterion is when the bubble departure diameter is larger than the channel diameter, such that bubble growth is confined by the size of the channel cross section (there are many bubbles in a macrochannel). Hence, the threshold to confined bubble flow could be taken as the microscale threshold. The bubble departure diameter in nucleate pool boiling d_{sub} is given (Fritz, 1935) by

$$d_{\text{bub},F} = 0.0208 \beta \left[\frac{\sigma}{g(\rho_L - \rho_G)} \right]^{1/2}$$

where the contact angle β is in degrees and the effect of cross flow on bubble departure is ignored. For application to a wider range of pressures

Todos os artigos incluem:

- Hiperlinks para referências, figuras e artigos relacionados
- Conversões de unidades no texto

Adicionar aos gerenciadores de citações

Widget de Faixas de Operação do Trocador de Calor

Passe o mouse sobre
cada bloco para mais
detalhes



Clique nos blocos ou use
este menu lateral para
selecionar ou desmarcar o
tipo de trocador de calor

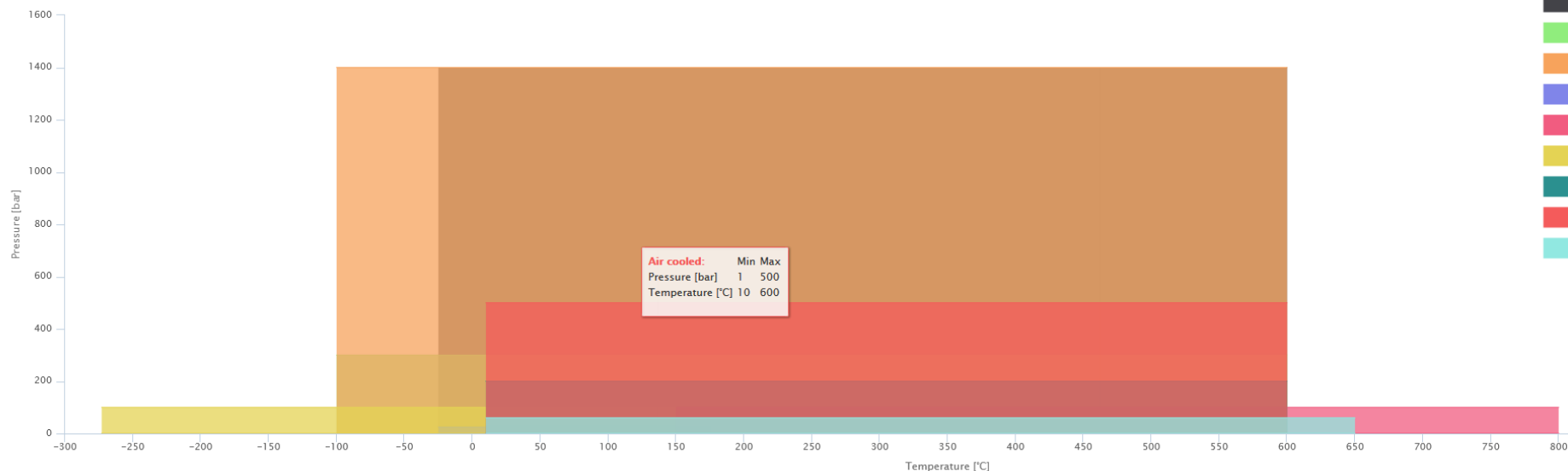


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apresentações



Heat Exchanger Operating Ranges

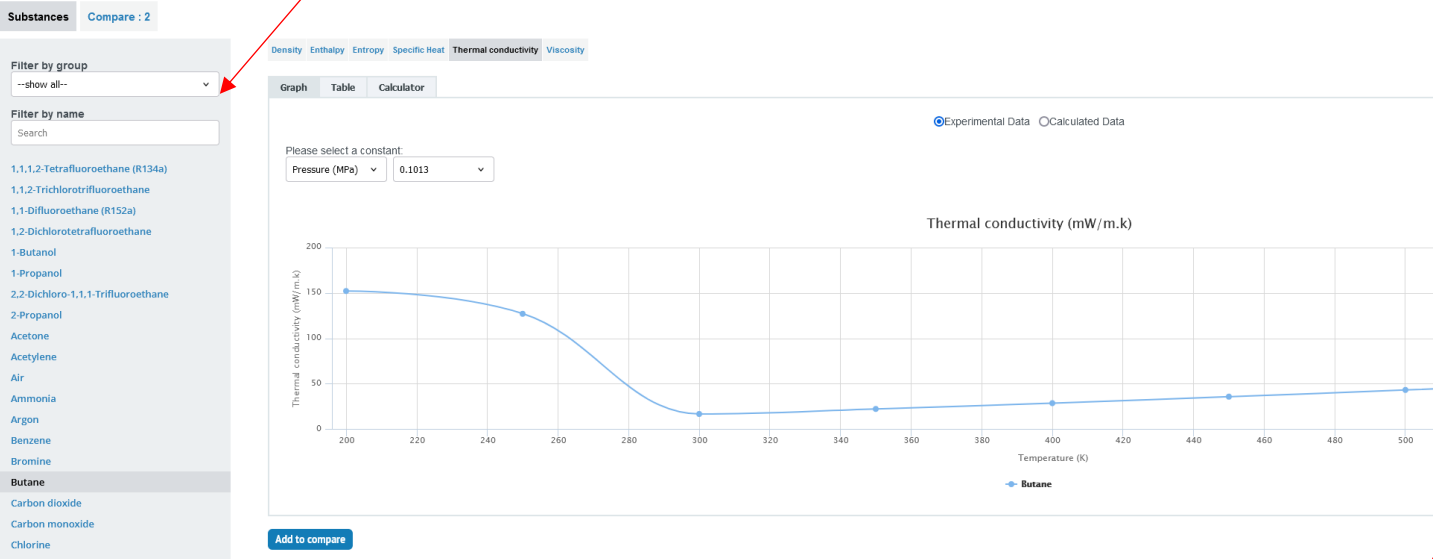
Recommended operating ranges of different heat exchanger types





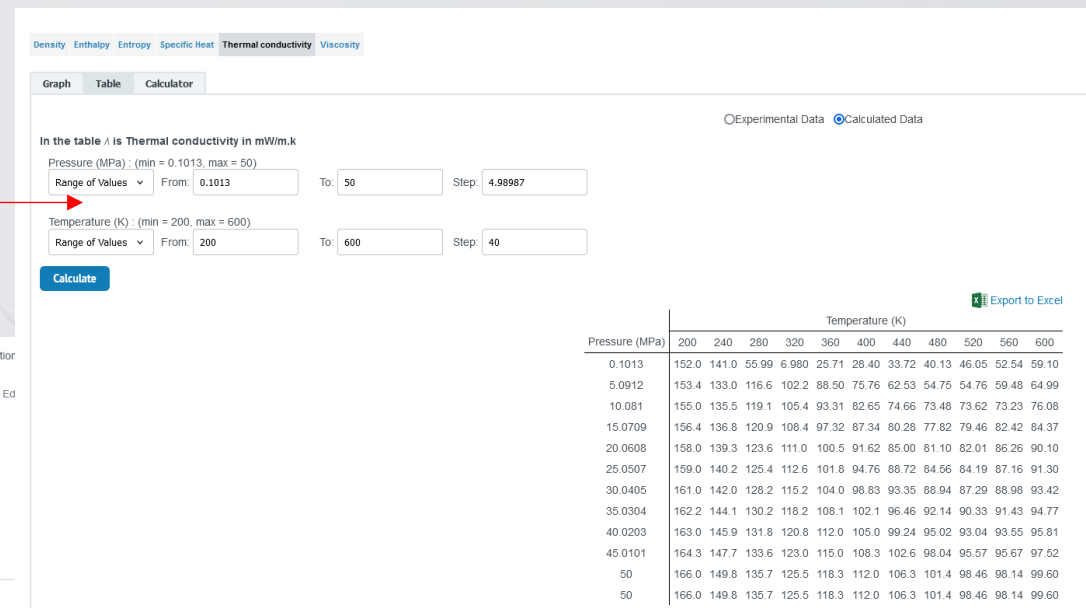
Escolha substâncias da lista para visualizar suas propriedades físicas como um gráfico ou tabela. OU selecione "calculadora" para inserir e mapear seus próprios dados

Physical Properties Widget: Butane



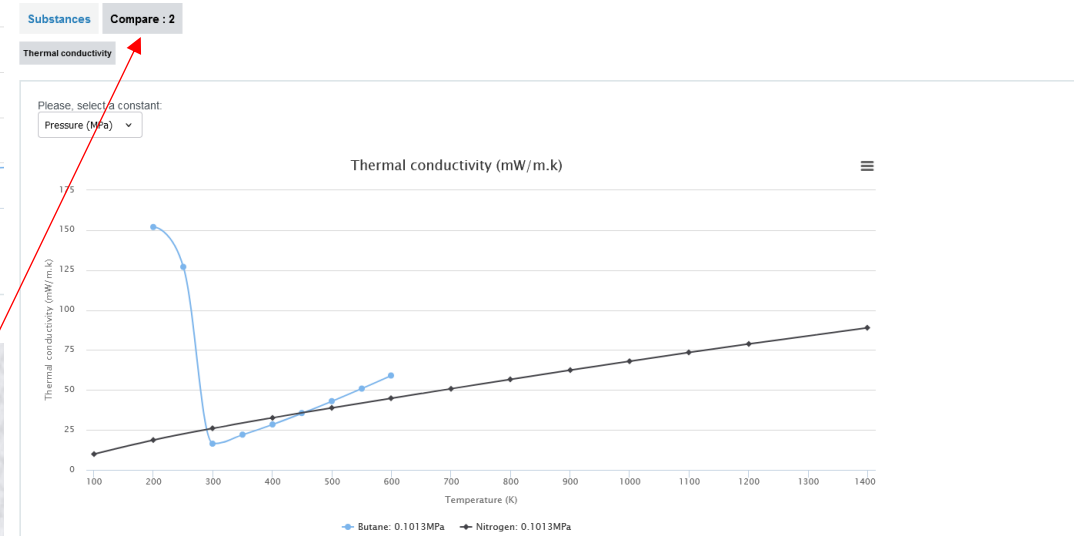
Para mapear/comparar várias substâncias:

- Selecione cada substância e clique em "Adicionar para comparar"
- Em seguida, clique em "Comparar: 2" no canto superior esquerdo



Add to compare

Physical Properties Widget



Condenser Type Selection Wizard

Wizard by F. Coletti, information by A.C. Muller, D. Butterworth, H.R. Jacobs

Condenser design involves evaluation of the specified process conditions, together with other potential physical, thermal, and economic limits in order to select potential types of condenser. Basic requirements: (1) it must be operable over a range of conditions including design point... [read more](#)

✓

Step 1: Select type of condensation

Partial

Total

✓

Step 2: Select operating pressure

Very low (P<1 bar)

Intermediate (1<P<25 bar)

High (P>25 bar)

✓

Step 3: Select vapor characteristics

Non corrosive

Corrosive

Very corrosive

✓

Step 4: Select operating temperature

Low (T<400°C)

High (T>400°C)

✓

Step 5: Select fouling characteristics

Moderate

Severe coolant

Severe vapor

✓

Step 6: Can the condensate freeze?

No

Yes

✓

Step 7: Is the vapor single or multicomponent?

Single component

Multiple component

✓

Step 8: Is the gas noncondensable?

No

Yes

✓

Step 9: Tube-side pressure drop

Low

High

✓

Step 10: What phase is the coolant in?

Liquid

Gas

Boiling

✓

Step 11: Can the two fluids be mixed?

No

Yes

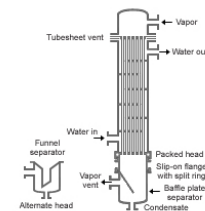
Reset

Responda à lista dinâmica de perguntas para identificar o tipo de equipamento correto para o seu projeto

	Preferred Configuration	Optional Configuration
Fluid allocation:	Tube-side condensation	Shell-side condensation
Orientation:	Vertical	Horizontal
Configuration:	Downflow	Cross "X"
Acceptability:	Good	Fair
Predictability:	<50%	<50%
Acceptability pressure drops:	Good	Good
Predictability pressure drops:	>50%	<50%
Advantages:	Good control of venting. Handles dirty or polymerizing vapors.	Can handle freezing condensate. Good control of venting. Can use finned or enhanced tubes.
Disadvantages:	Poor for pressure below 25 mmHg absolute. Tubesheet vents required.	-
Notes:	-	-
Relevant section	read more...	read more...

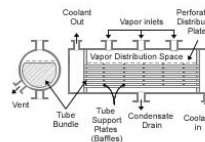
needed to determine the best economic choice. This design must meet certain

Preferred Configuration



Fluid allocation: Tube-side condensation
Orientation: Vertical
Configuration: Downflow
[show details](#)

Optional Configuration



Fluid allocation: Shell-side condensation
Orientation: Horizontal
Configuration: Cross "X"
[show details](#)

<< Compare options

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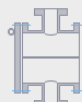
TEMA Type Configuration Wizard

DID YOU KNOW?

The TEMA type configuration wizard allows to generate and visualize the possible configurations of shell-and-tube heat exchangers according to the Tubular Exchanger Manufacturers Association standards.

Front Head Types

A



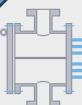
Channel and removable cover

B



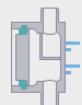
Integral cover

C



Channel integral with tubesheet and removable cover

D



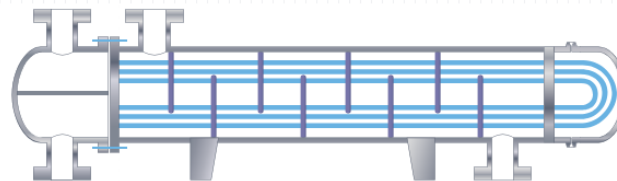
Special high pressure closure

N



Channel integral with tubesheet and removable cover

BEU with Segmental Baffles



Passe o mouse sobre
cada opção para ver
detalhes, pontos
positivos e negativos

Shell Types

E



One pass shell

F



Two pass shell with longitudinal baffle

G



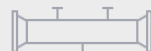
Split flow

H



Double split flow

I



Two shells side passes separated by a longitudinal baffle.
Advantages: provides pure countercurrent flow in a two tube-side pass unit, allows for close approach temperature.
Disadvantages: possible leakages across the longitudinal baffle.

K



Kettle type reboiler

X



Cross flow

Baffle Types

L



Single segmental

M



Double segmental

Rear Head Types

L



Fixed tubesheet like 'A' stationary head

M



Fixed tubesheet like 'B' stationary head

N



Fixed tubesheet like 'C' stationary head

P



Outside packed floating head

S



Floating head with backing device

T



Pull through floating head

U



U-tube bundle

W



Externally sealed floating tubesheet

Construa seu
próprio trocador de
calor selecionando
o equipamento

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Visual Gallery



Compact Heat Exchangers

Illustration of plate fins stacked for a cross-flow heat exchanger configuration.

[INTERACTIVE VERSION](#)



Double Pipe

Simple double pipe arrangement.

[INTERACTIVE VERSION](#)

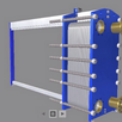


Plate and frame heat exchangers

The plates are clamped together in a frame between a fixed head plate (or head)...

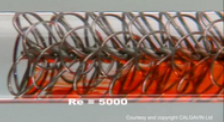
[INTERACTIVE VERSION](#)



Shell-and-Tube

Typical shell-and-tube heat exchanger.

[INTERACTIVE VERSION](#)



Tube Inserts

Effects of tube inserts. Curtesy and copyright CalGavin Ltd

Compact Heat Exchangers

Illustration of plate fins stacked for a cross-flow heat exchanger configuration.

[INTERACTIVE VERSION](#)

Double Pipe

Simple double pipe arrangement.

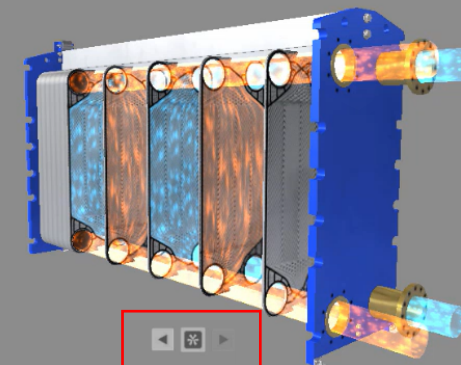
[INTERACTIVE VERSION](#)

Plate and frame heat exchangers

The plates are clamped together in a frame between a fixed head plate (or head)...

[INTERACTIVE VERSION](#)

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Alcalde	Diego P.	Heat exchangers
Alencar Jr.	Jose P.	Conduction

Thermodynamics and Thermophysical Properties

- ☐ Properties of pure substances
- ☐ Properties of mixtures
- ☐ Nucleation phenomena
- ☐ Equilibrium thermodynamics
- ☐ Equations of state
- ☐ Activity
- ☐ Fugacity
- ☐ Inversible thermodynamics
- ☐ Non-equilibrium effects
- ☐ Metastability
- ☐ Metamaterials
- ☐ Measurement

Fluid Flow Fundamentals

- ☐ Equations of motion
- ☐ Closure relationships
- ☐ Non-newtonian fluid mechanics
- ☐ Gas dynamics
- ☐ Shock waves
- ☐ Transition
- ☐ Turbulence
- ☐ Turbulence models
- ☐ Flow-structure interaction
- ☐ Boundary layers

Heat Transfer Fundamentals

- ☐ Black body

Phase Change Heat Transfer

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- ☐ Condensation
- ☐ Melting
- ☐ Solidification
- ☐ Ablation
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- ☐ Bio fuels
- ☐ Thermodynamics of Combustion
- ☐ Adiabatic flame temperature
- ☐ Soot formation and properties
- ☐ Ignition
- ☐ Diagnostics

Porous Media

- ☐ Porous Media

Atomization and sprays

- ☐ Atomization and sprays

Radiative Heat Transfer

- ☐ Radiative heat transfer
- ☐ Black body

Energetic Materials and Chemical Propulsion

- ☐ Synthesis of energetic materials
- ☐ Formulation of energetic materials
- ☐ Processing of energetic materials
- ☐ Characterization of energetic materials
- ☐ Insensitive munitions
- ☐ Aging of energetic materials
- ☐ Stability of energetic materials
- ☐ Recycling and disposal of energetic materials
- ☐ Detonation
- ☐ Deflagration
- ☐ Thermobarics
- ☐ Thermixes
- ☐ Liquid rocket propulsion
- ☐ Solid rocket propulsion
- ☐ Hybrid rocket propulsion
- ☐ Thermal protection materials
- ☐ Green propellants

Extreme Temperature Phenomena and Cryogenics

- ☐ Cryogenic processes
- ☐ Low-temperature
- ☐ Low-pressure
- ☐ Rapid cooling
- ☐ Cryogenic measurement
- ☐ Low-temperature thermophysics
- ☐ High temperature environments

Thermal Sciences in Biomedicine

- ☐ Thermal properties of tissues
- ☐ Heat and mass transfer in the human body
- ☐ Thermal confort
- ☐ Thermal therapies
- ☐ Thermal protection of animals in nature
- ☐ Lasers in biomedicine
- ☐ Cooling and preservation
- ☐ Bio-hydrodynamics
- ☐ Blood flow studies

Micro and Nanoscale Thermal Sciences and Engineering

- ☐ MEMS
- ☐ Heat transfer physics (electrons, phonons etc.)
- ☐ NEMS
- ☐ Fluid flow and heat transfer in micro and nanochannels

Safety Aspects in Engineering and Thermal Sciences

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- ☐ Nuclear accidents
- ☐ Waste management
- ☐ Vapour explosions
- ☐ Venting and Blowdown

Experimental Thermal Sciences

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- ☐ Instrumentation

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Zhuomin M. Zhang
George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA 30332, USA

Vish Prasad
Department of Mechanical Engineering, University of North Texas, Denton, Texas 76207, USA

Yogesh Jaluria
Department of Mechanical and Aerospace Engineering, Rutgers-New Brunswick, The State University of New Jersey, Piscataway, NJ 08854, USA

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Avijit Karmakar, Hanwei Zhou, Bairav S. Vishnugopi, Partha P. Mukherjee
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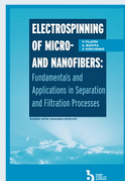
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Electrospinning of Micro- and Nanofibers: Fundamentals in Separation and Filtration Processes

Y. Filatov

Karpov Institute of Physical Chemistry, 10, Vorontsovo Pole st., Moscow, 105064 Russia

A. Budyka

Karpov Institute of Physical Chemistry, 10, Vorontsovo Pole st., Moscow, 105064 Russia

V. Kirichenko

Karpov Institute of Physical Chemistry, 10, Vorontsovo Pole st., Moscow, 105064 Russia

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Atmospheric pollution caused by the uncontrolled development of industrial technologies, has now reached the danger point, past which its irreversible effect on natural factors and the resulting danger to living organisms and to future human generations starts outweighing the advantages of technological progress. The increase in the appearance and development of increasingly more ecology-damaging industries such as nuclear power generation, modern chemistry and biotechnologies, have resulted in the appearance of the so-called ecology-protection technologies. The danger of environmental pollution, leads to the optimal selection of environmental protection technologies and monitoring their effectiveness lies outside the competence of those who design and operate polluting industries and becomes increasingly more the prerogative of special expert and monitoring services. High-efficiency gas purification by Petryanov filters is one such universally acknowledged aerosol-removal technology. These filters are made of fibrous materials obtained by means of electrospinning. The substance and capabilities of this method, the use of the fibrous materials produced by it, the various and unique separating properties embodied in the present volume. The authors know that the present monograph will be useful not only to design and production engineers but also to a number of other experts, whose activity in the scientific, industrial, managerial, judicial, educational and humanitarian fields is related to some extent to the problem of protecting the environment and the health of the population. The following topics are included in this book: Mechanism of electrospinning of fibrous materials and the structure of these materials, Raw materials, Effect of the properties of the spinning solution on the course of formation and properties of fibers, Technology of electrospinning of fibrous materials (Petryanov Filters) and their analogs, Relationships governing the capture of aerosol particles by fibrous filters, Functional and performance properties of Petryanov-Filter (PF) materials and of their analogs, Construction, testing, manufacturing and assortment of fibrous PF-materials based high-efficiency aerosol filters, and Applications of modular high-efficiency aerosol filters and filtering stations employing PF filtering materials and their analogs for high-efficiency gas filtration.

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Introduction

Nomenclature



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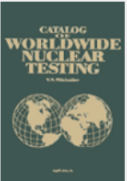
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