C.01.01.Z1 – Biblioteca Simplificada de Gás Ideal

Aplicação em FTHA – Finite Time Heat Addition Otto Engine Model

Prof. C. Naaktgeboren, PhD

https://github.com/CNThermSci/ApplThermSci

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Equação de Estado (EoS): Comportamento $P - T - v$

$$Pv = RT \qquad\qquad P\bar{v} = \bar{R}T \qquad \rightharpoondown$$

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Cada equação com forma nas bases mássica, e molar, com $R = \bar{R}/M$ — armazenar $\bar{R}$ e M!

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Modelo de $\bar{c}_p(T)$ Polinomial:

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Armazenar a_i, T_{min} e T_{max} e saber as conversões (i) $a_i \to b_i$ e (ii) $\bar{c}_{p,v}(T) \to c_{p,v}(T)$.

Modelo de $\bar{c}_p(T)$ Polinomial: $\bar{u}(T)$

$$\bar{u}(T) = \int_{T_{ref}}^{T} \bar{c}_v(T)\, dT = \int_{T_{ref}}^{T} \sum_{i=1}^{4} b_i T^{i-1}\, dT, \qquad T_{min} \leqslant T \leqslant T_{max} \qquad \rightarrow$$

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Modelo de $\bar{c}_p(T)$ Polinomial: $\bar{h}(T) = \bar{u}(T) + \bar{R}T$

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Modelo de $\bar{c}_p(T)$ Polinomial: $P_r(T)$ e $v_r(T)$

$$\left(\frac{P_2}{P_1}\right)_s = \frac{P_{r2}}{P_{r1}} \qquad \left(\frac{v_2}{v_1}\right)_s = \frac{v_{r2}}{v_{r1}} \qquad \rightarrow$$

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- Sem requisitos adicionais de armazenamento!

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- Sem requisitos adicionais de armazenamento!
- Sem conversões de base!

Padrões nos Cálculos:

$$\bar{c}_p(T) = a_1 + a_2 T + a_3 T^2 + a_4 T^3, \qquad T_{min} \leqslant T \leqslant T_{max} \qquad \neg$$

Padrões nos Cálculos:

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\begin{aligned}
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- Verificação de limites;
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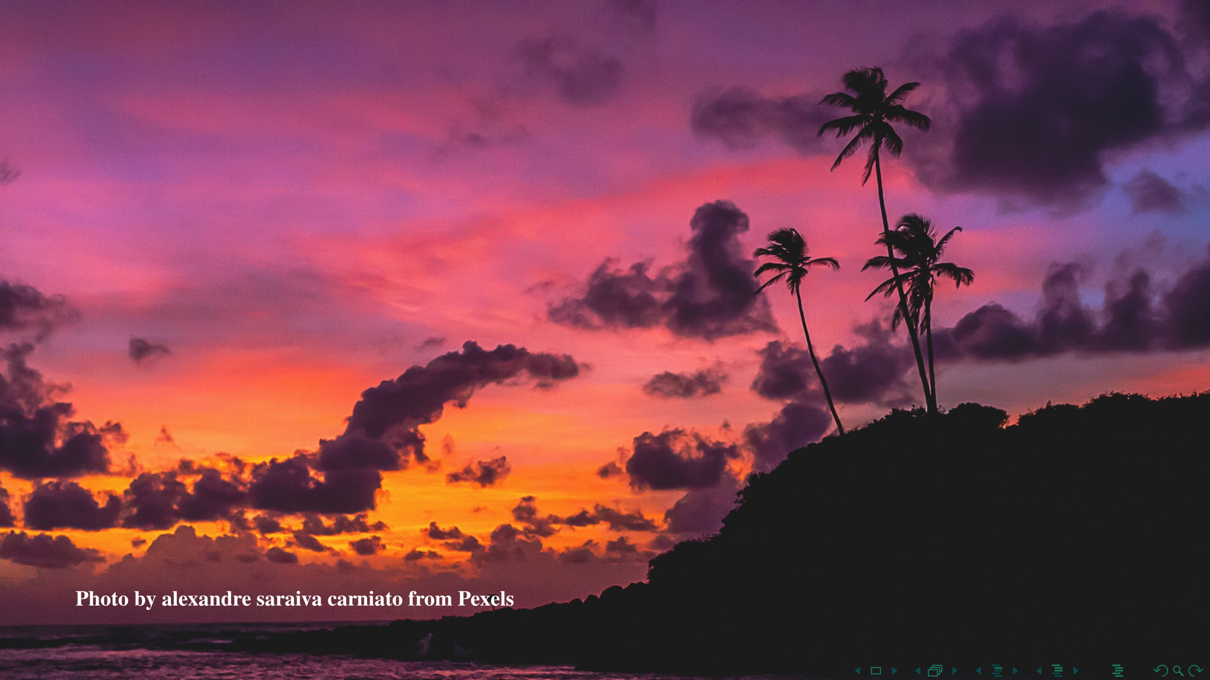
- Produtos matriciais.

```julia
# Universal gas constant
R̄() = 8.314472 # ± 0.000015 # kJ/kmol·K

# Standard Tref
Tref() = 298.15 # K

# IG (Ideal Gas) structure: values for each gas instance
struct IG
    MW                  # Molecular "Weight", kg/kmol
    CP::Ntuple{4}       # Exactly 4 c̄p(T) coefficients
    Tmin                # T_min, K
    Tmax                # T_max, K
    sref                # s̄°ref, kJ/kmol·K
end
```



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