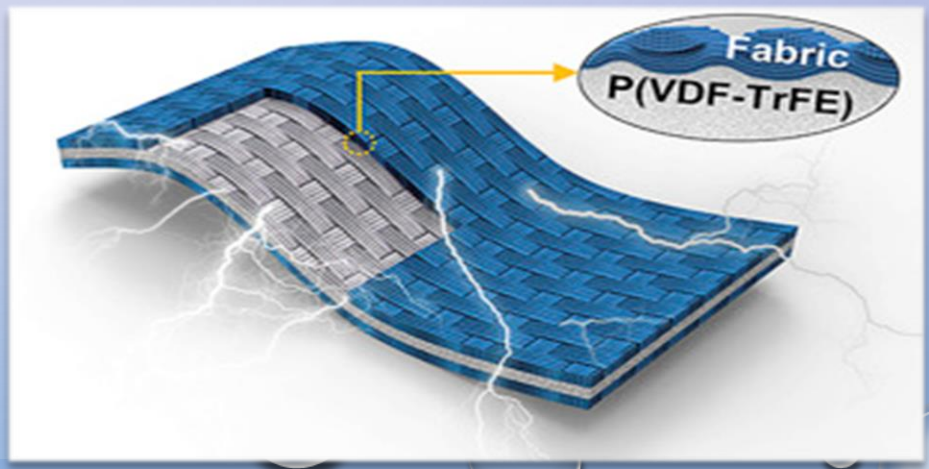
CONICET

UNIVERSIDAD NACIONAL de MAR DEL PLATA

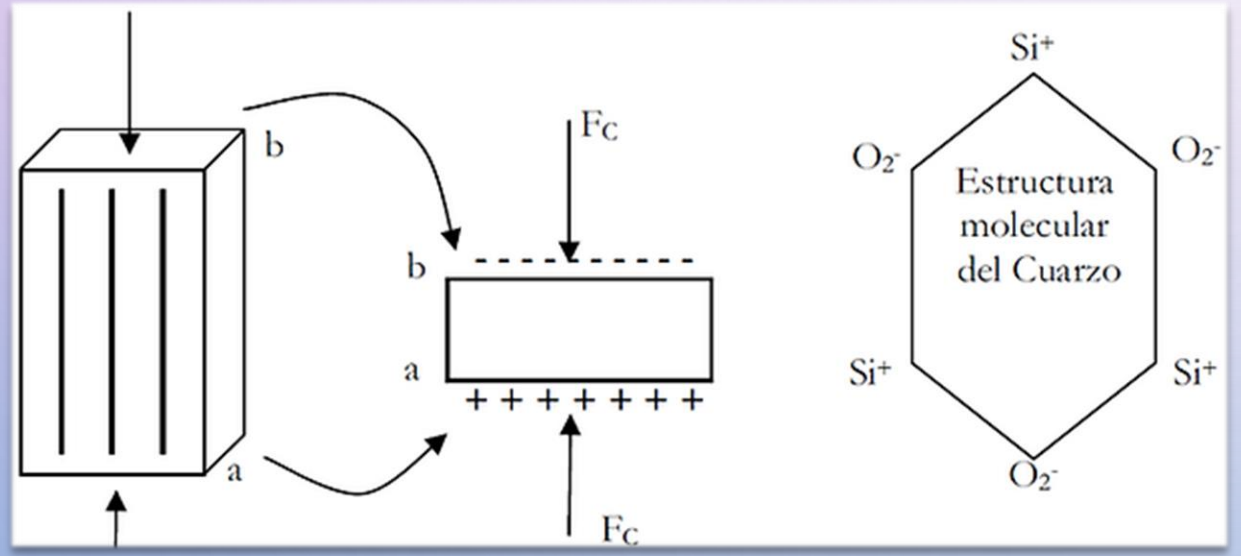
I F I M A R

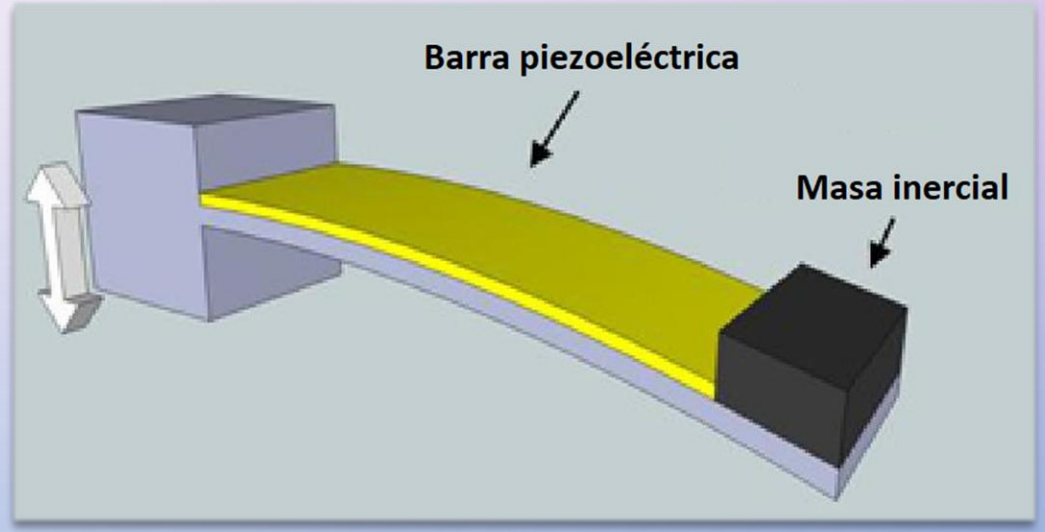
ESTUDIO DE COSECHADORES DE ENERGÍA MEDIANTE EL POTENCIAL DE NO EQUILIBRIO

COSECHADORES DE ENERGÍA

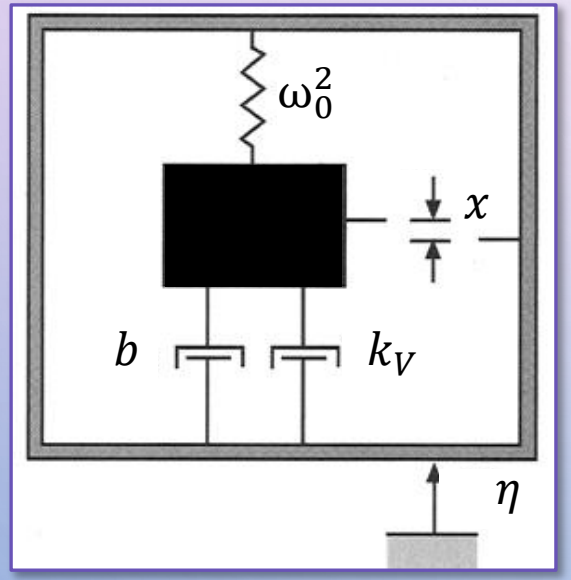


CRISTALES PIEZOELÉCTRICOS





MODELO



$$\ddot{x} = -\omega_0^2 x - b\dot{x} - k_V V + \epsilon\,\eta$$

$$\dot{V} = k_c v - \frac{V}{\tau_p}$$

$$\dot{x} = v$$

$$\dot{v} = -\alpha x - v - kV + \eta$$

$$\dot{V} = v - \theta V$$

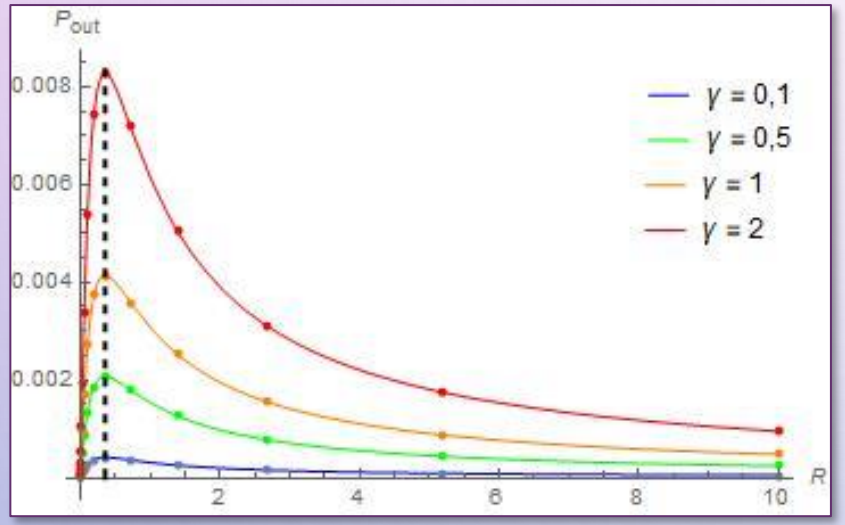
$$\langle \eta(t)\eta(t') \rangle = \gamma\delta(t - t')$$

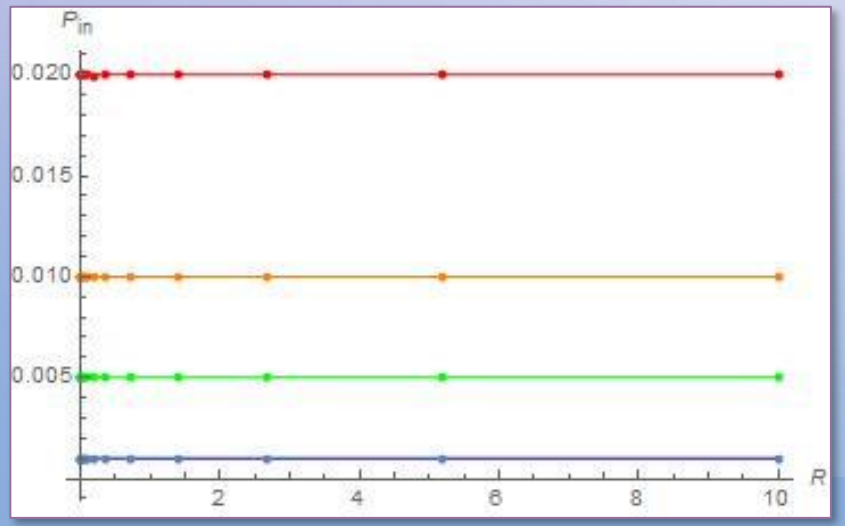
POTENCIAL DE NO EQUILIBRIO

$$P(\mathbf{x}) \propto e^{\left(-\frac{\varphi(\mathbf{x})}{\gamma}+\mathrm{o}(\gamma)\right)} \rightarrow \varphi(\mathbf{x}) = -\lim_{\gamma\to 0}\gamma \ln P(\mathbf{x},\gamma)$$

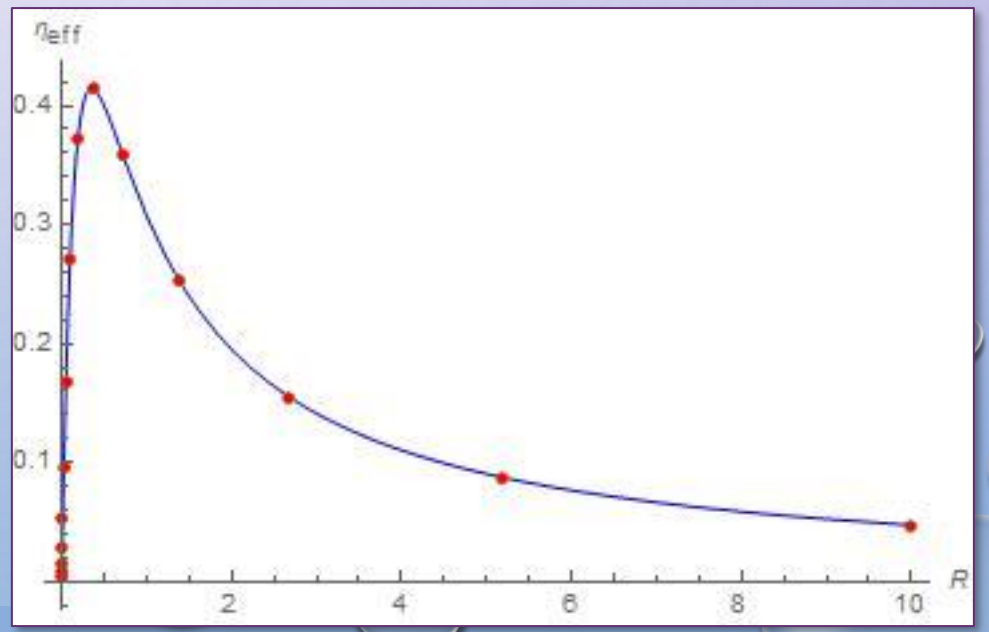
- Correlaciones
- Análisis termodinámico
- Expandir a cosechadores más complejos

CORRELACIONES





$$\eta_{eff} = \frac{P_{out}}{P_{in}}$$



ANÁLISIS TERMODINÁMICO

- $F = -\gamma \ln Z$
- $S = -\int P \ln P$

$$F = \varphi - \gamma S$$

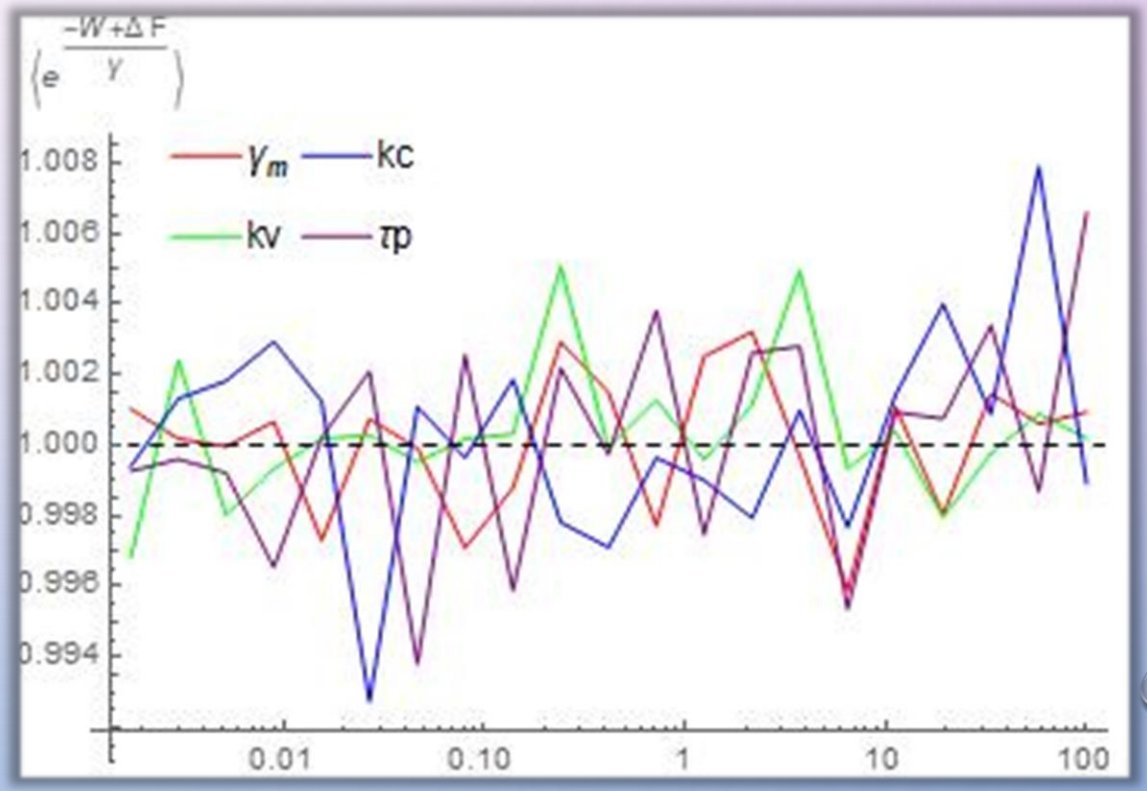
GENERACIÓN DE ENTROPÍA

$$\frac{dS}{dt} = \gamma^2(1+\theta) = -\boldsymbol{\mathcal{J}}.\boldsymbol{\mathcal{F}}$$

RELACIONES DE TRABAJO

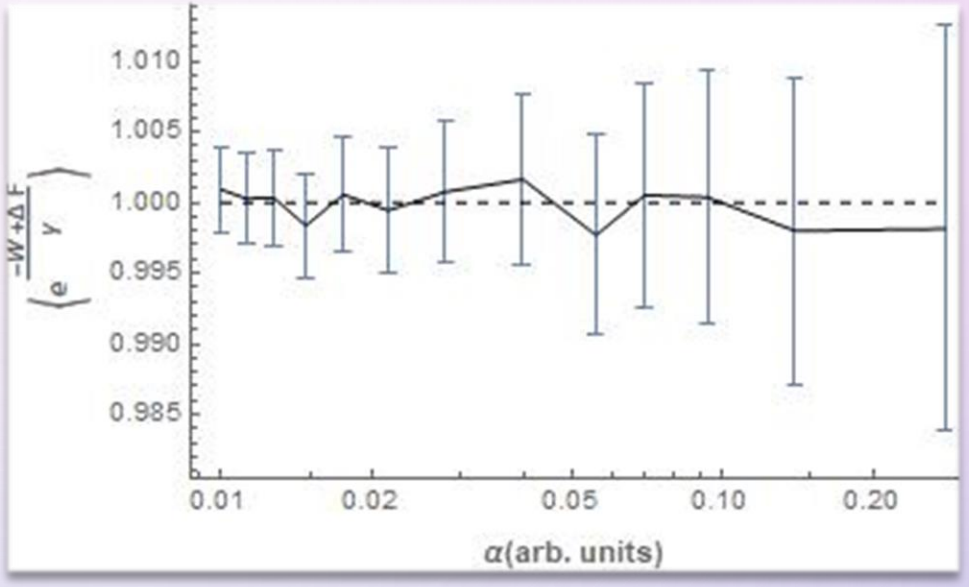
$$W = \int_0^{\tau} \dot{\alpha} \frac{d\varphi}{d\alpha} dt$$

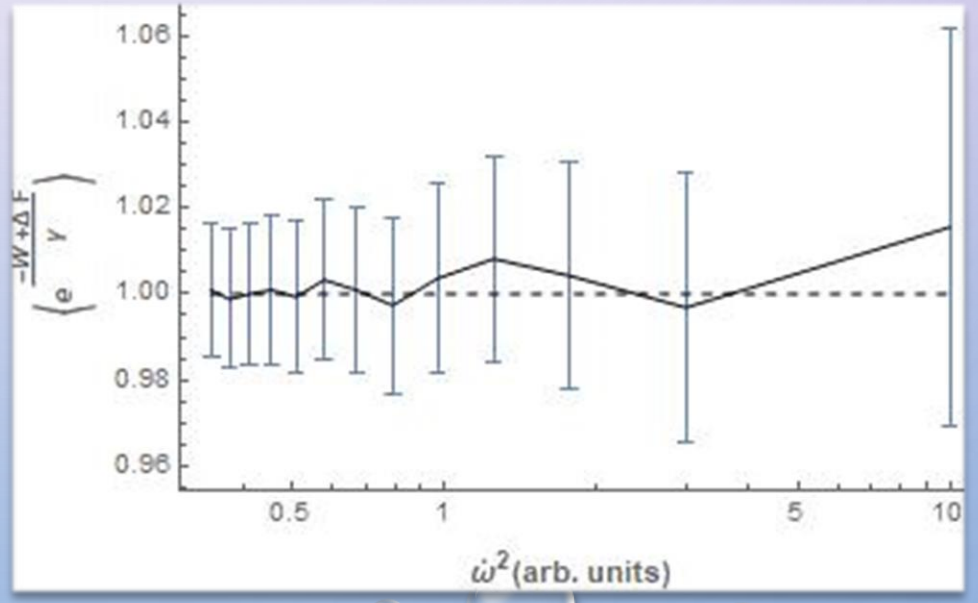
$$\left\langle e^{\frac{-W+\Delta F}{\gamma}} \right\rangle = 1$$



$$\langle W \rangle = \Delta F \; si \; \tau \to \infty$$

$$\langle W \rangle = \Delta F + \dot{\alpha}^2 \Lambda$$





TEOREMA DE EQUIPARTICIÓN

$$\left\langle x_i \frac{\partial H}{\partial x_j} \right\rangle = \delta_{ij} k_B T$$

$$\left\langle x_i \frac{d\varphi}{dx_j} \right\rangle = \delta_{ij} \gamma$$

$$T_{eff} = \frac{\gamma}{k_B}$$

RUIDO COLOREADO

- $\frac{d\eta}{dt} = -\lambda\eta + \sqrt{2a\lambda}\xi$

- $\frac{dS}{dt} = a\lambda(1 + \theta + \lambda)$

- $\left\langle x_i \frac{d\varphi}{dx_j} \right\rangle = \delta_{ij} 2a\lambda$

Gracias