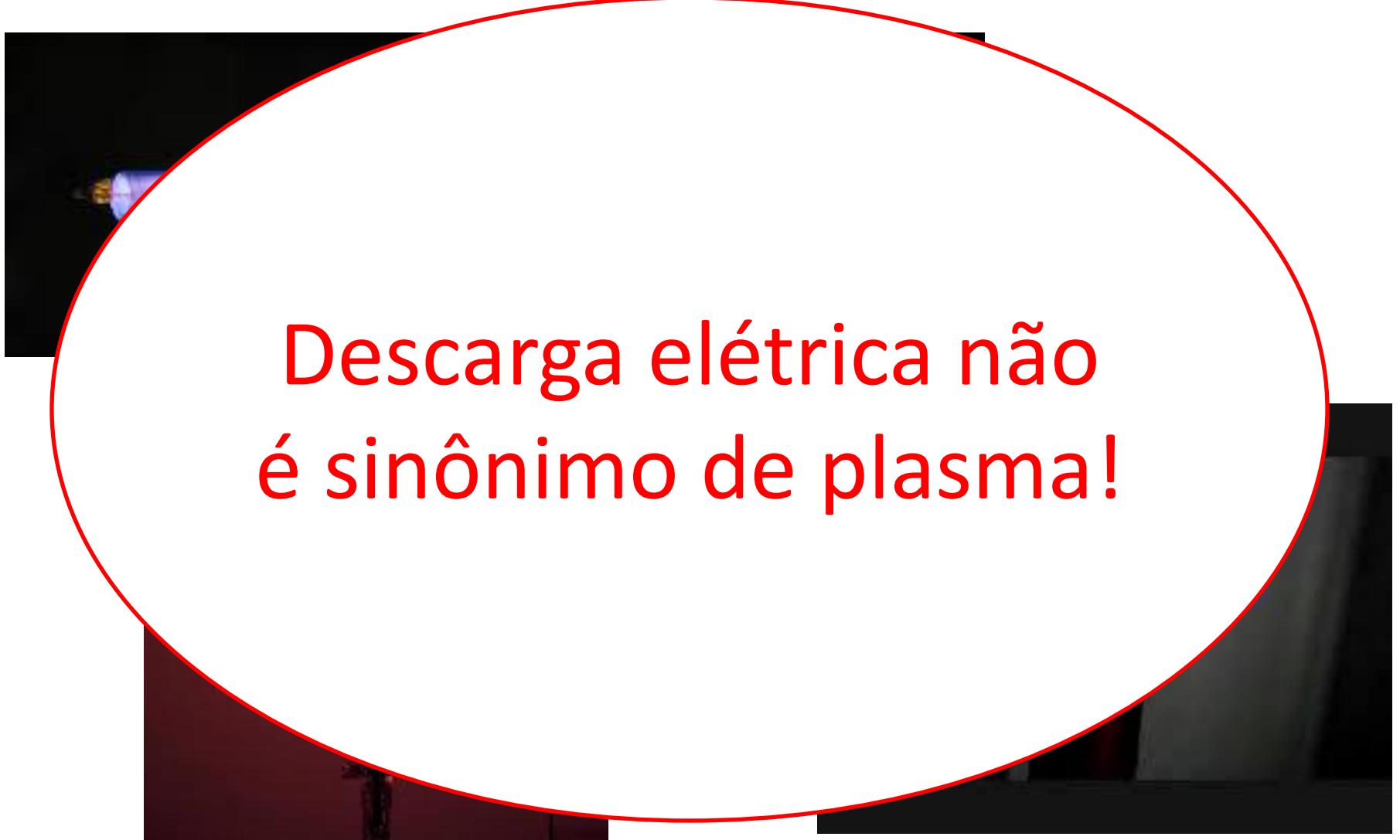


Descargas elétricas e plasmas

Julio César Sagás

Descargas elétricas em gases



Descarga elétrica não
é sinônimo de plasma!

Plasmas

Plasma é o quarto
estado da matéria?

Plasmas



el”):

ndo no qual as densidades de
emente iguais.

por **Langmuir** e **Tonks** quando

ío



espécie neutra

elétron



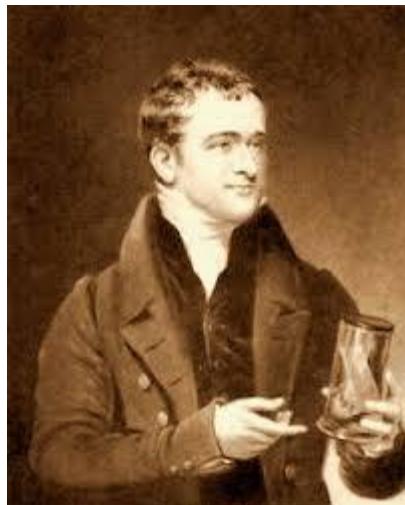
Um pouco de história



Um pouco de história



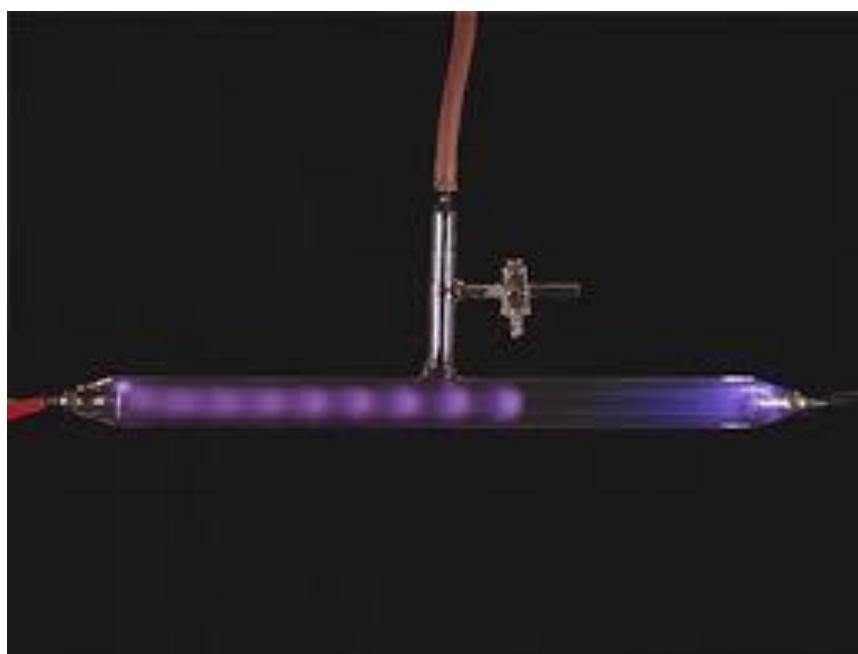
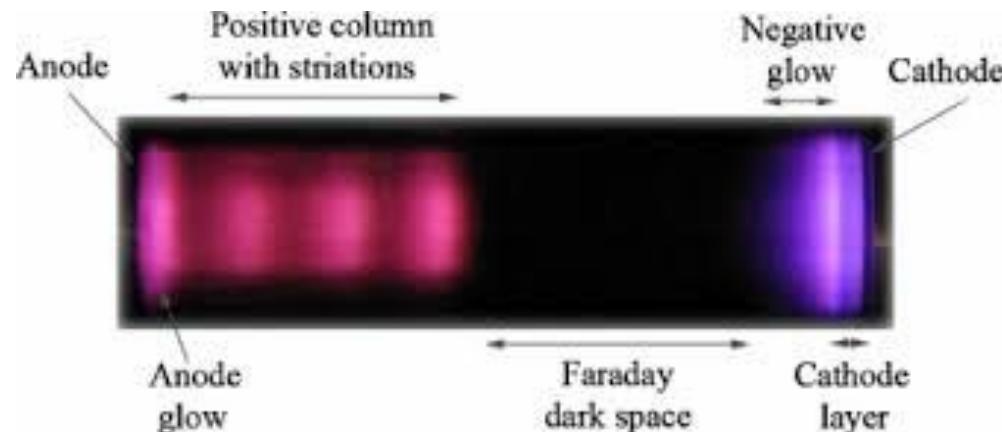
Ivan Petrov



Humphry Davy



Faraday e a descarga luminescente



Descargas Elétricas e a Física Moderna



Em 1858 Plücker descobre que uma descarga luminescente emite raios catódicos.

Crookes observou que o feixe se propaga em linha reta.

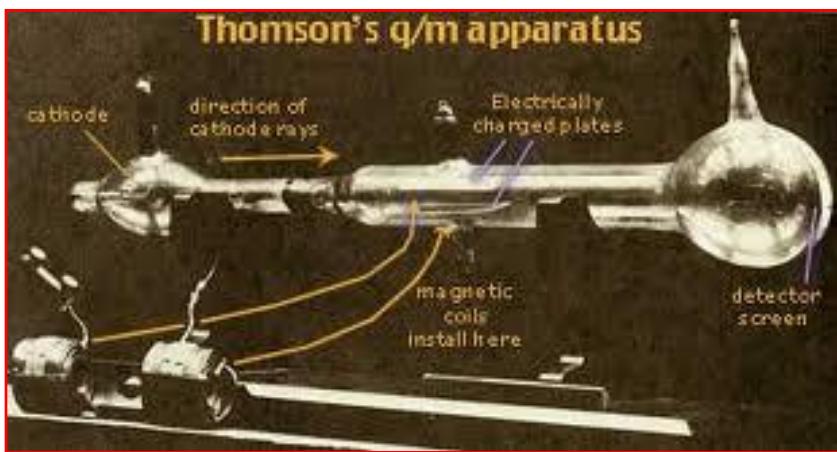
Em 1869, J. W. Hittorf mostrou que os raios catódicos são desviados por um campo magnético.

Em 1895, Perrin mostra que os raios catódicos depositam carga negativa no interior de um tubo de Crookes.

O experimento de Thomson

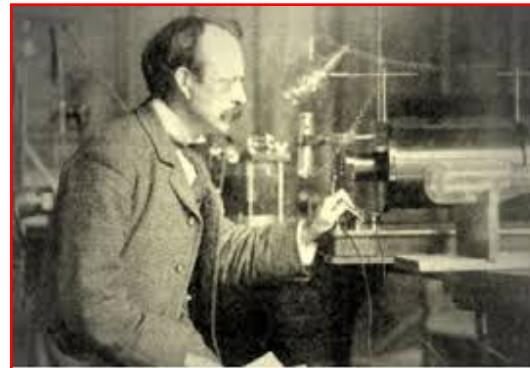
O arranjo experimental de J. J. Thomson

J. J. Thomson aprofundou seus estudos sobre a natureza dos raios catódicos e mediu a razão carga/massa das partículas que constituíam as partículas que o compunham.



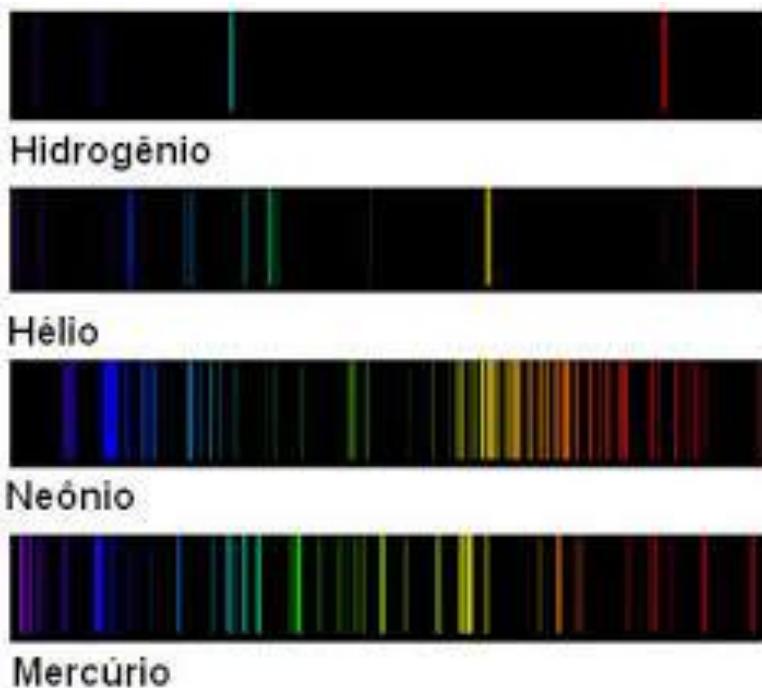
Arranjo experimental original utilizado por J. J. Thomson

Para isto *Thomson* utilizou um arranjo experimental similar ao mostrado ao lado.

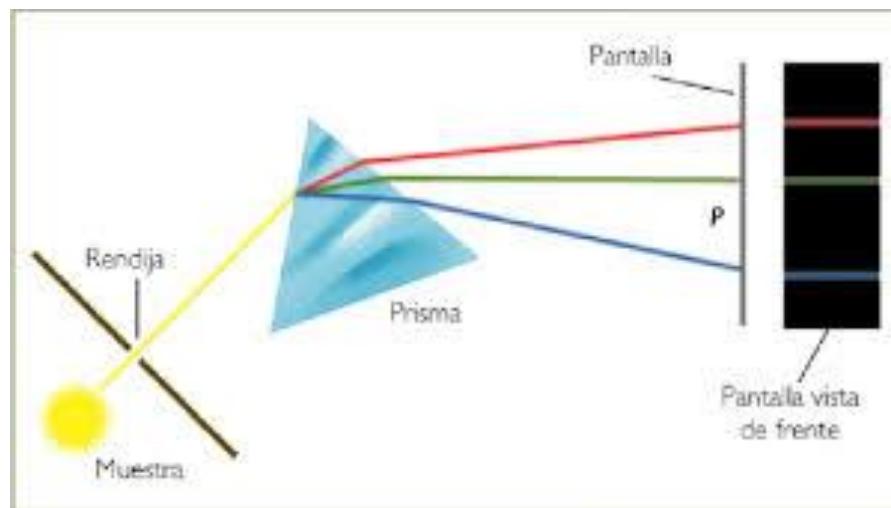


Fotografia de Thomson com seu aparato experimental

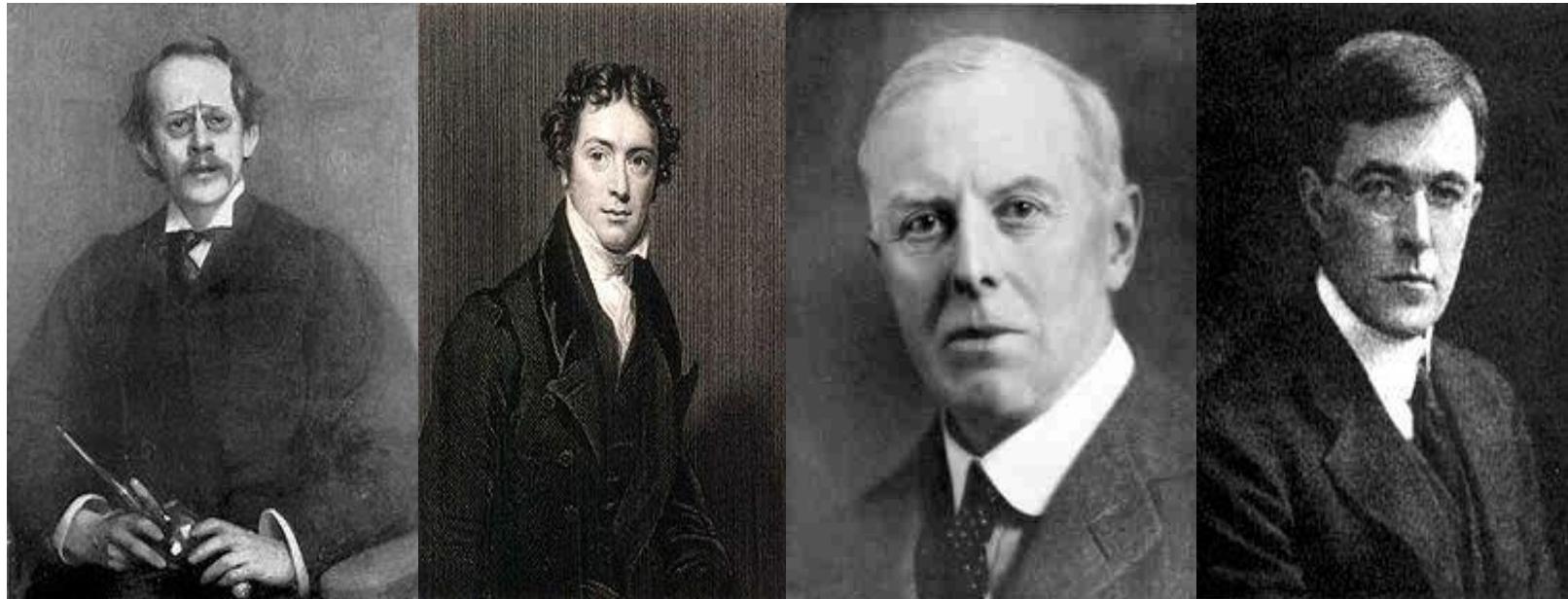
Espectros atômicos



$$\frac{1}{\lambda} = R_H \left(\frac{1}{2^2} - \frac{1}{n^2} \right)$$

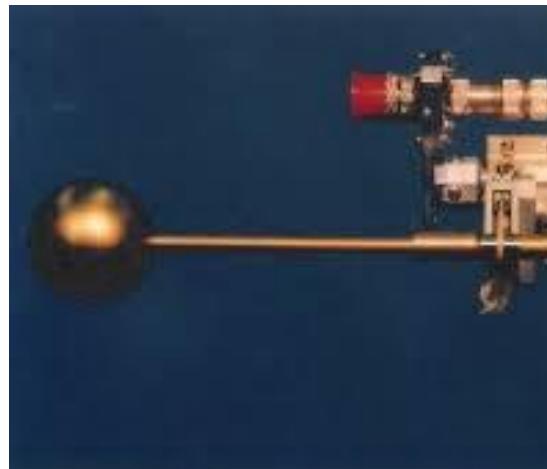
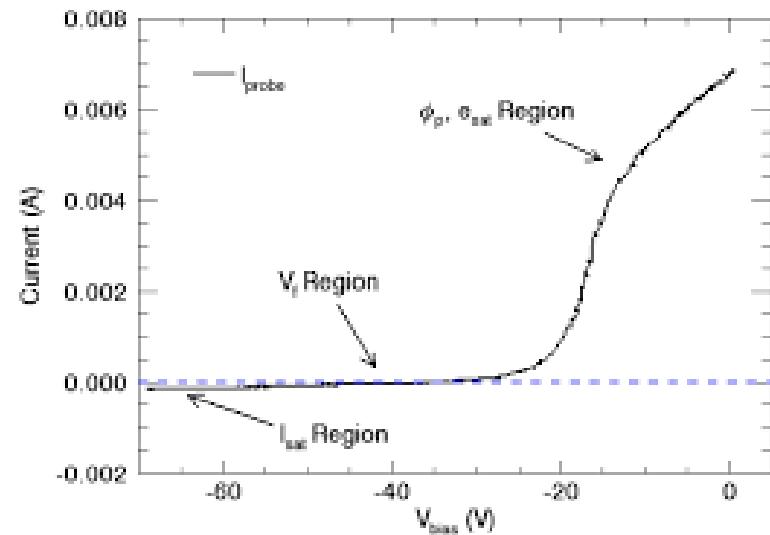


A escola de Townsend

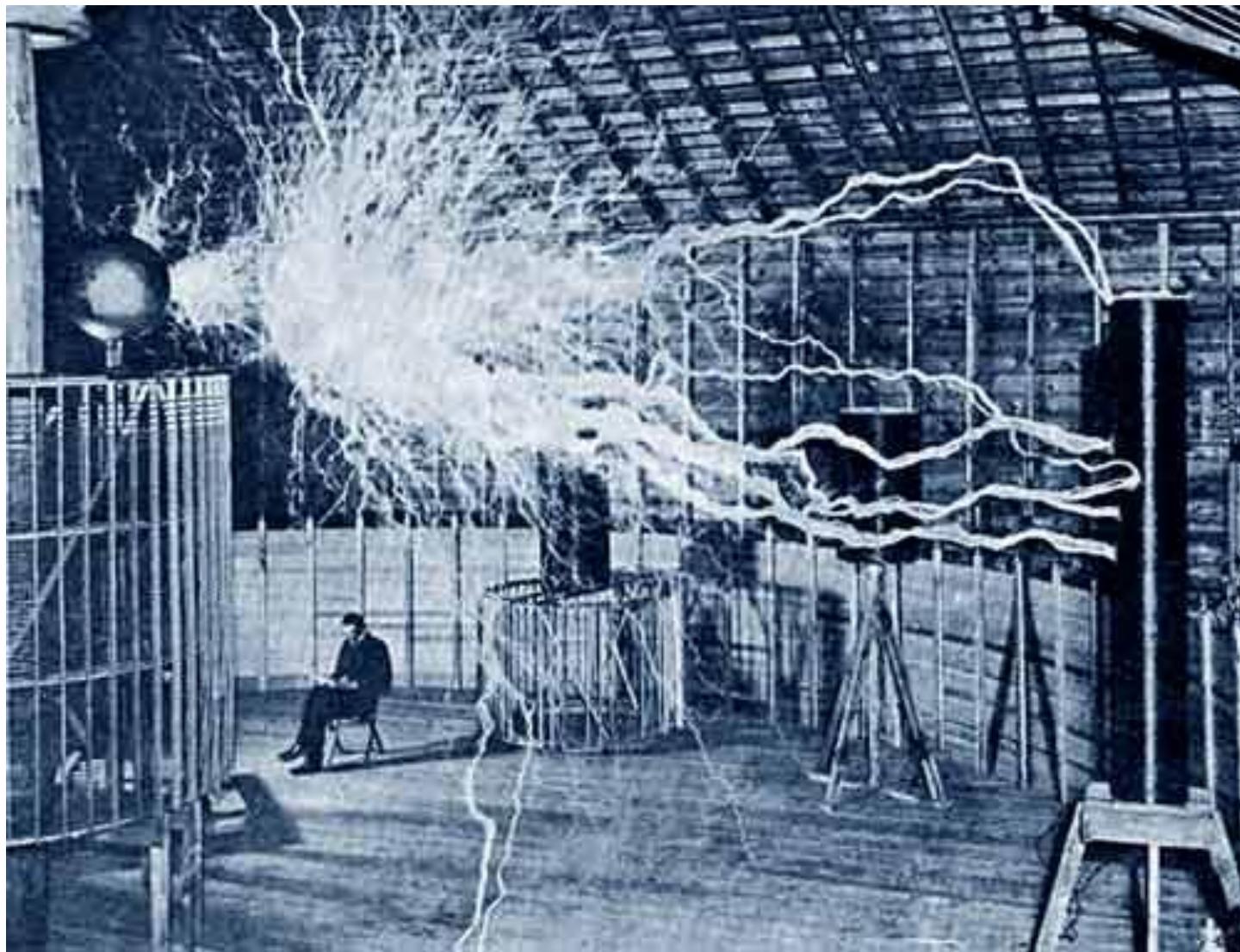


Da esquerda para direita: J. J. Thomson, Faraday, Townsend e Langmuir.

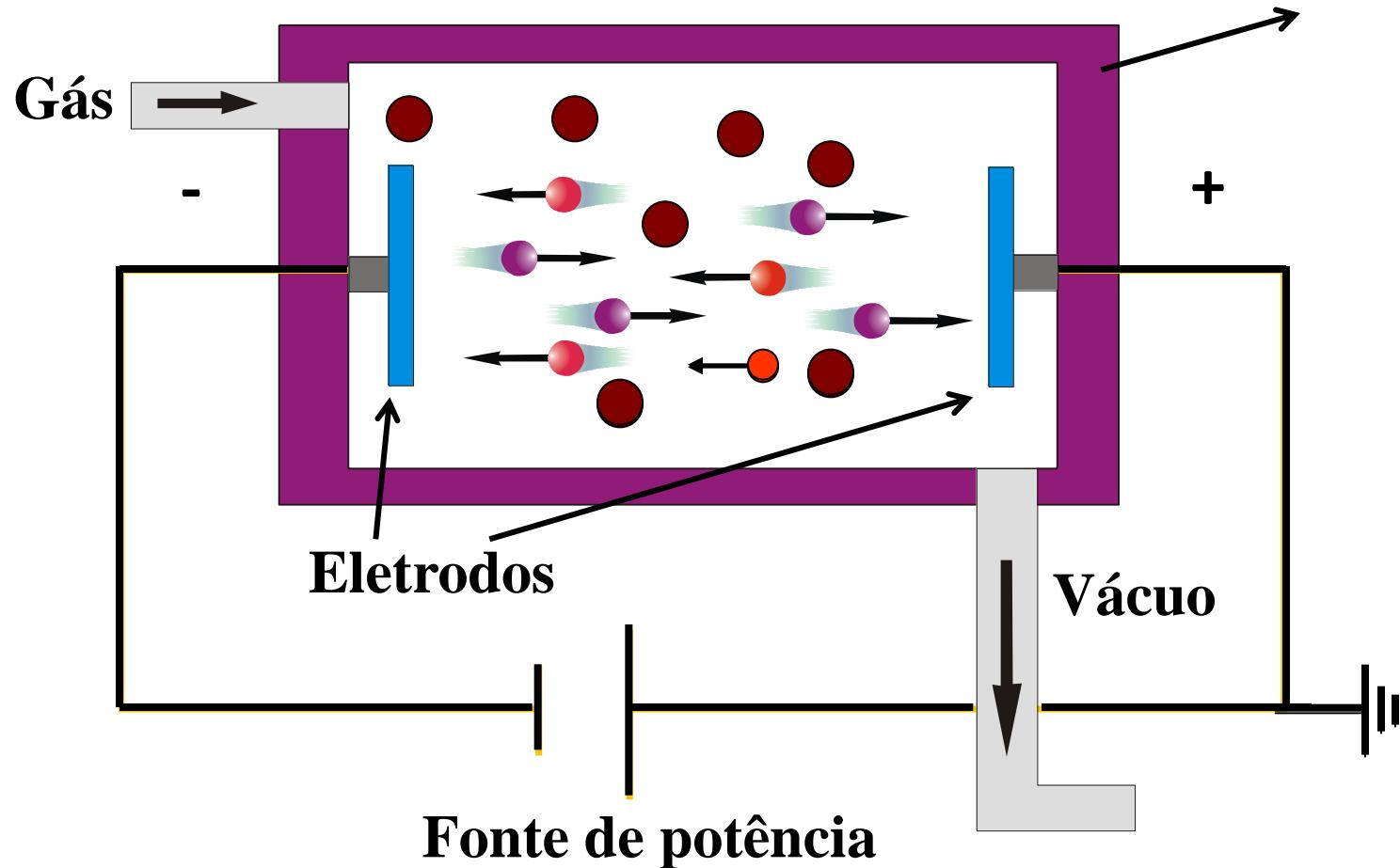
Langmuir



Tesla

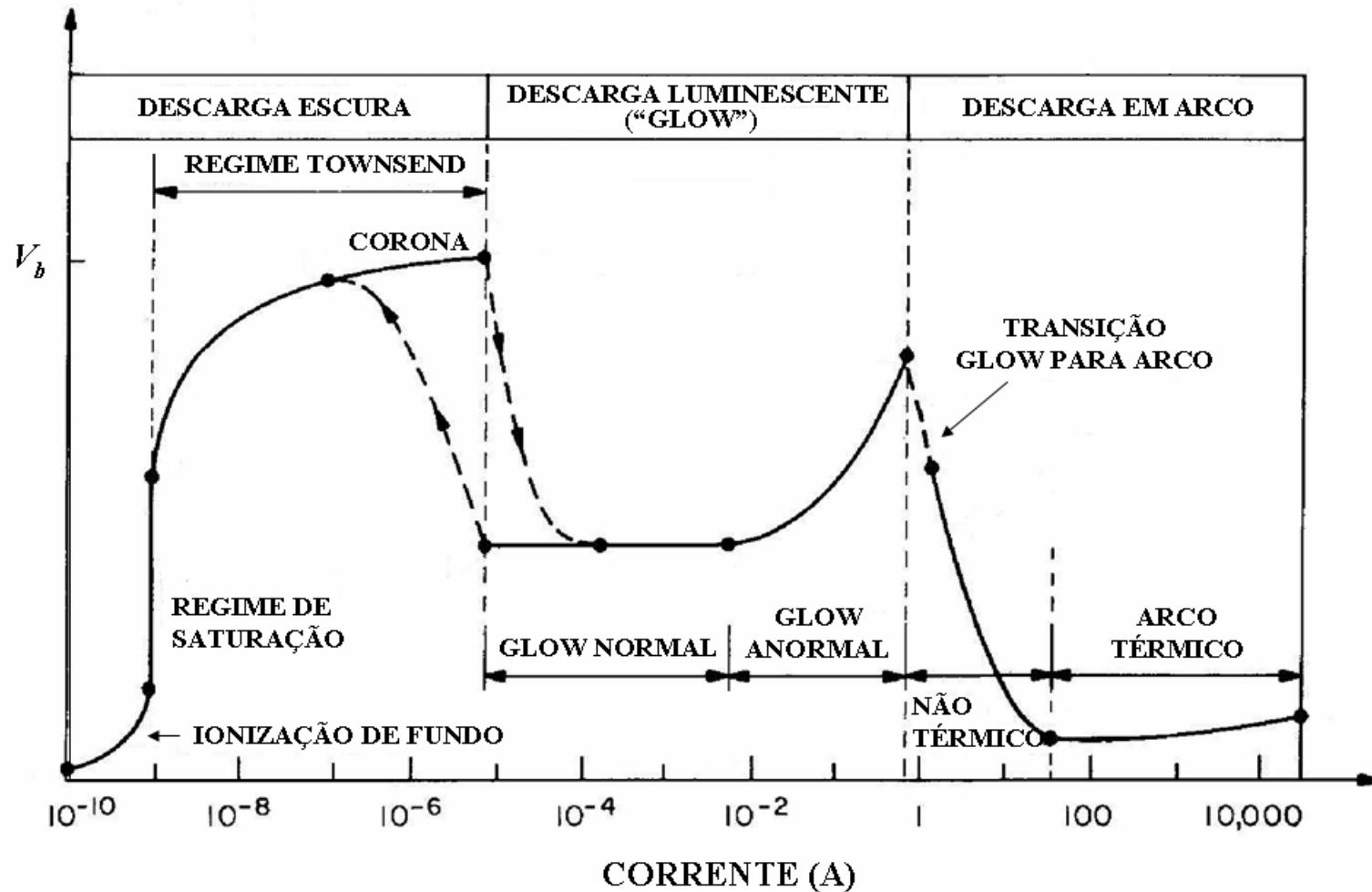


Como gerar um plasma?

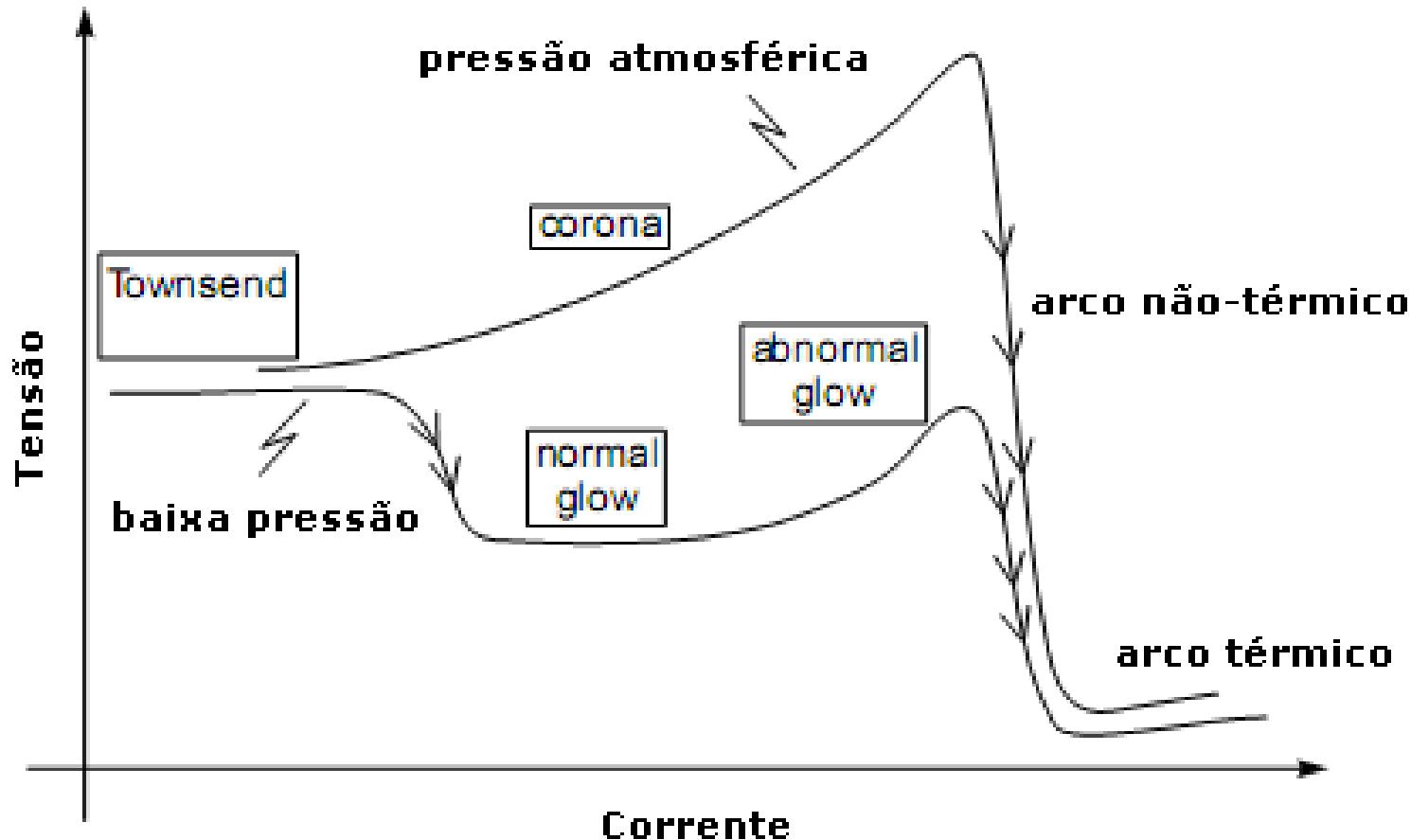


Como gerar um plasma?

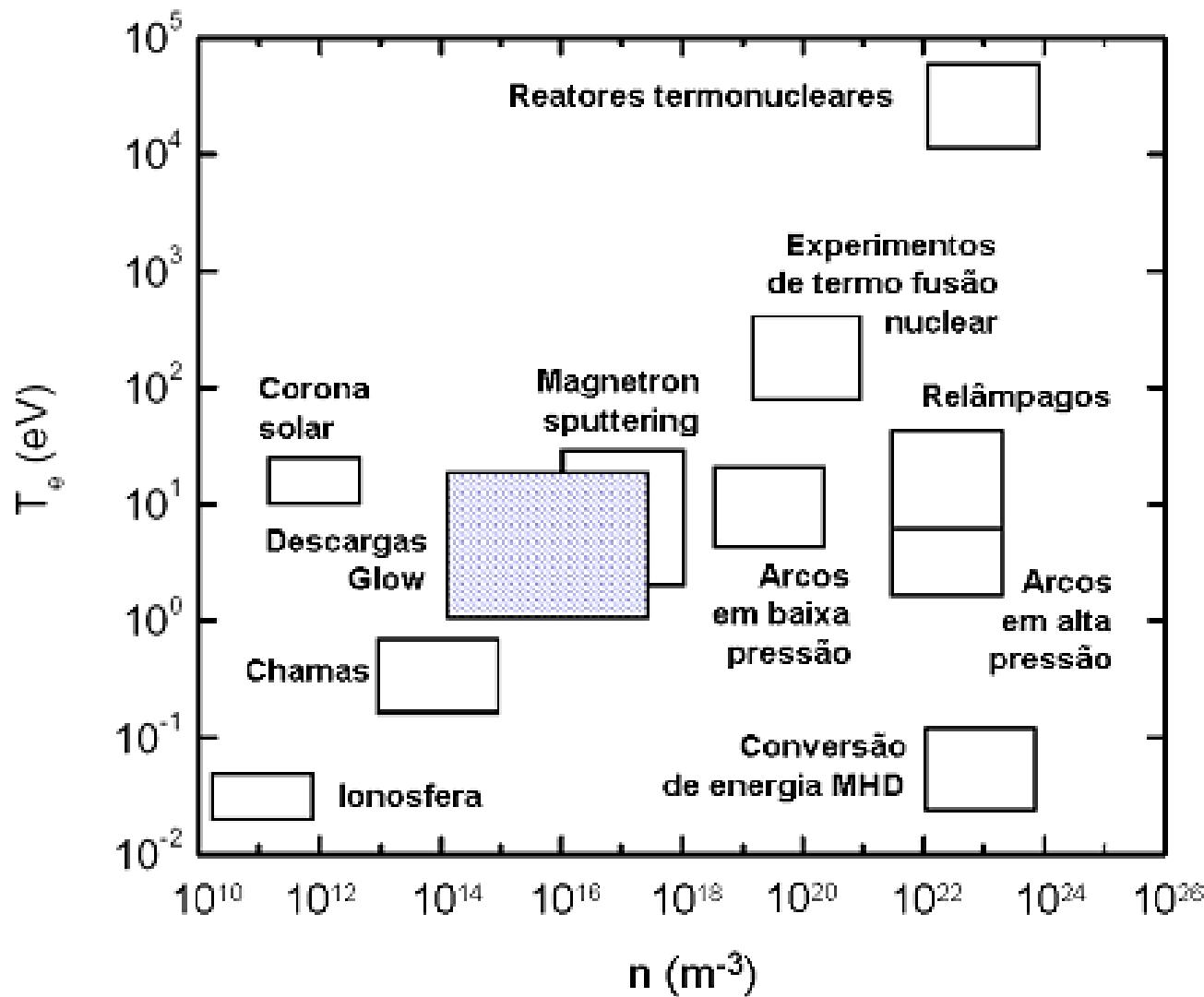
TENSÃO (V)



Como gerar um plasma?

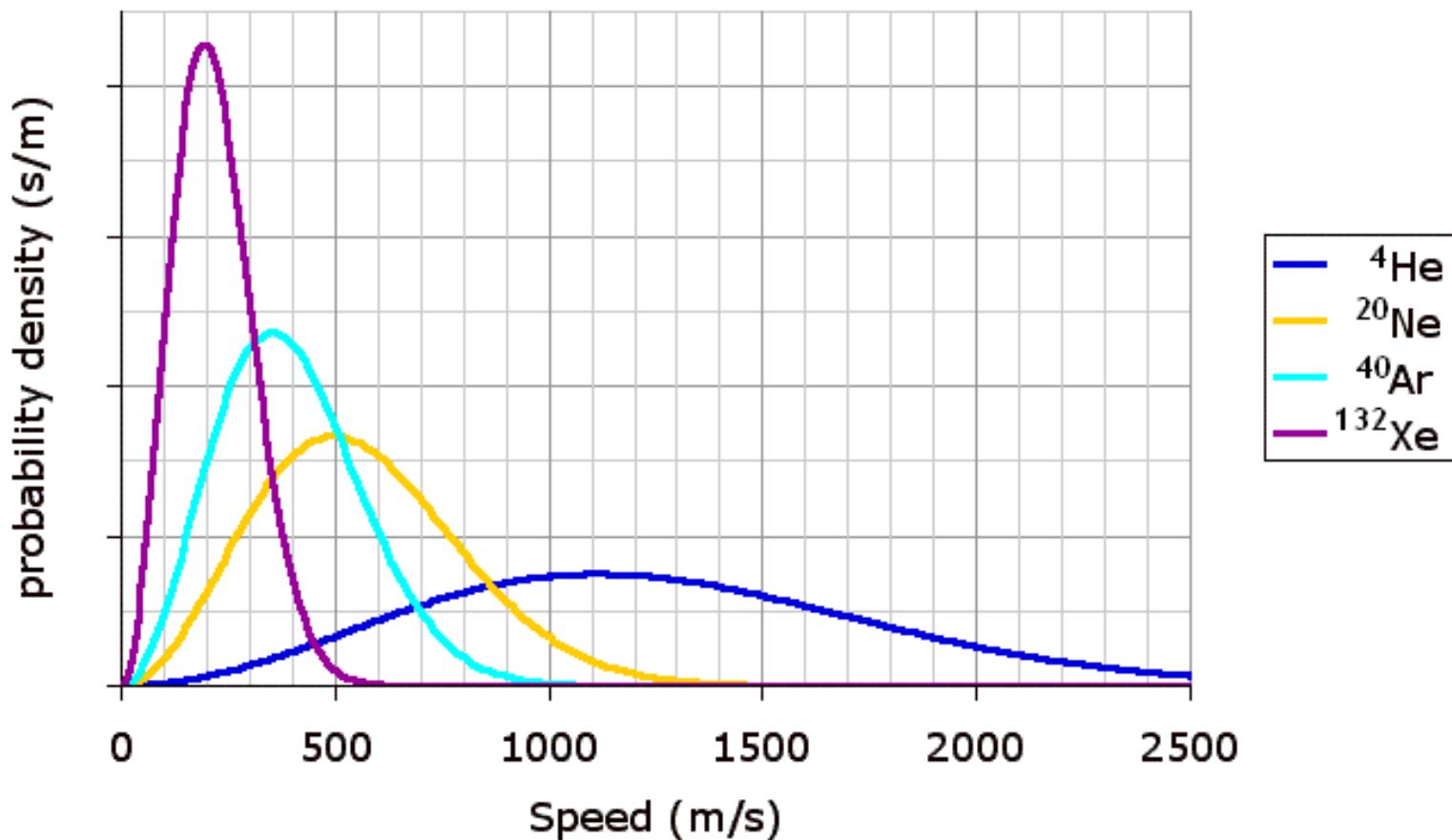


Propriedades de um plasma

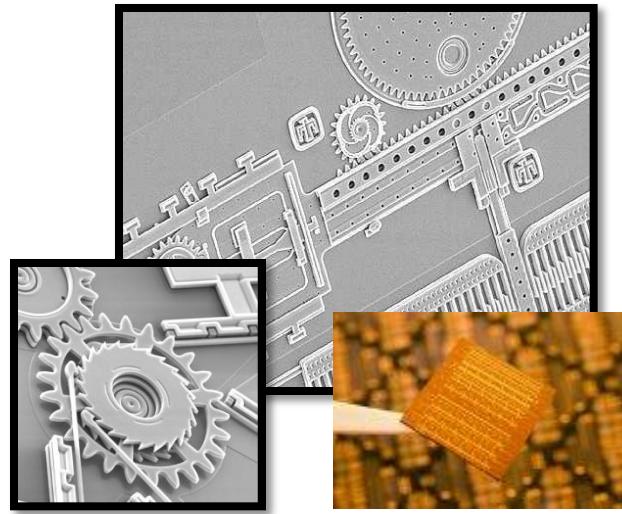
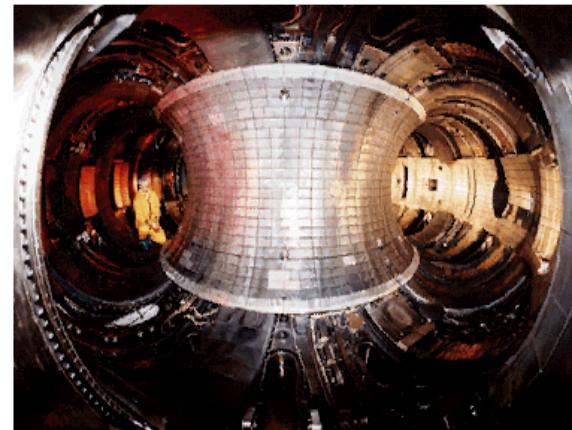
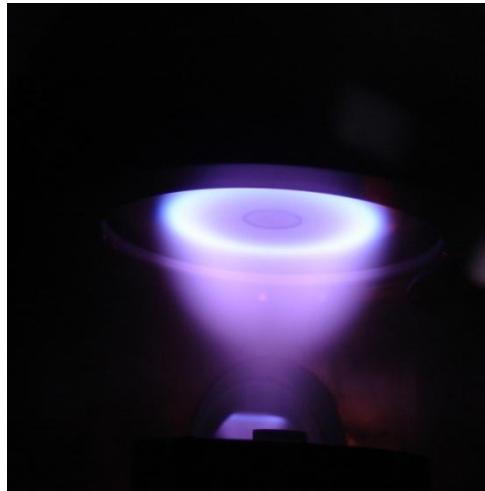


Propriedades de um plasma

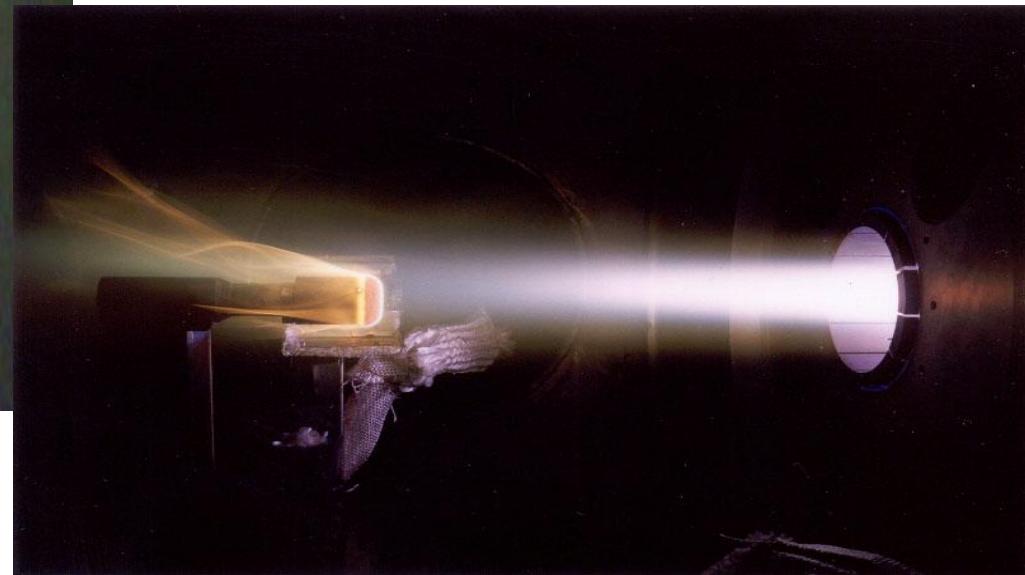
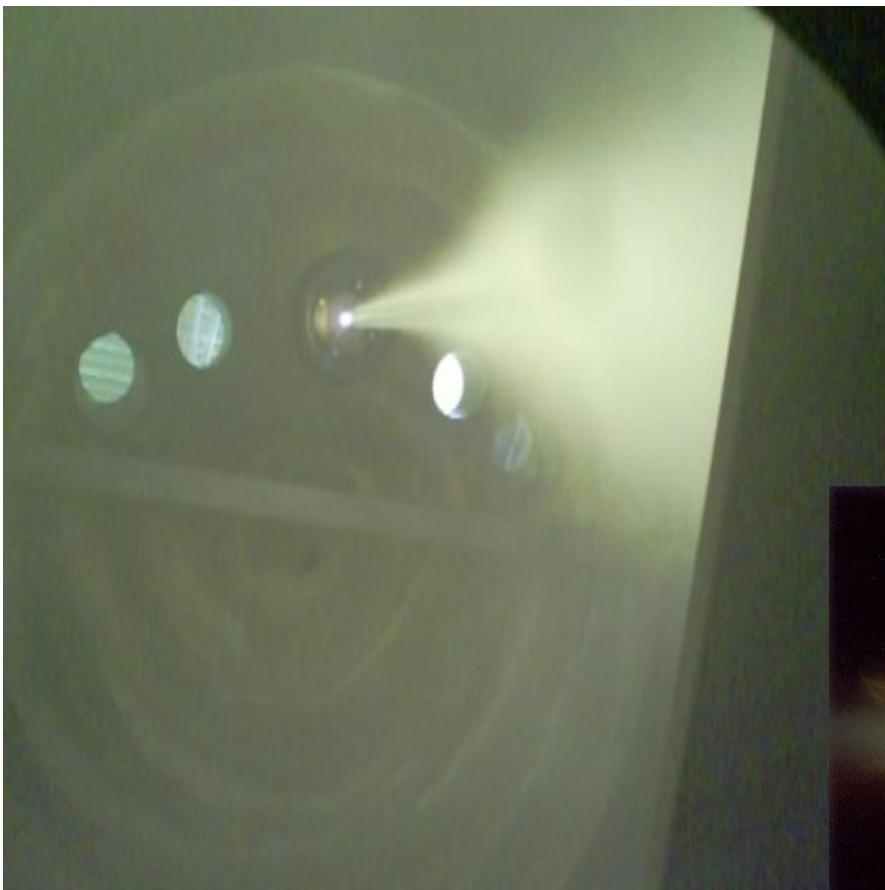
Maxwell-Boltzmann Molecular Speed
Distribution for Noble Gases



Aplicações



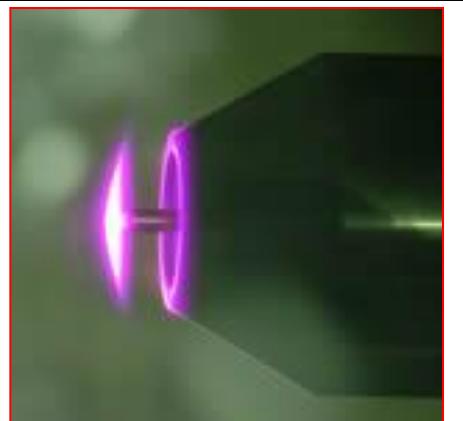
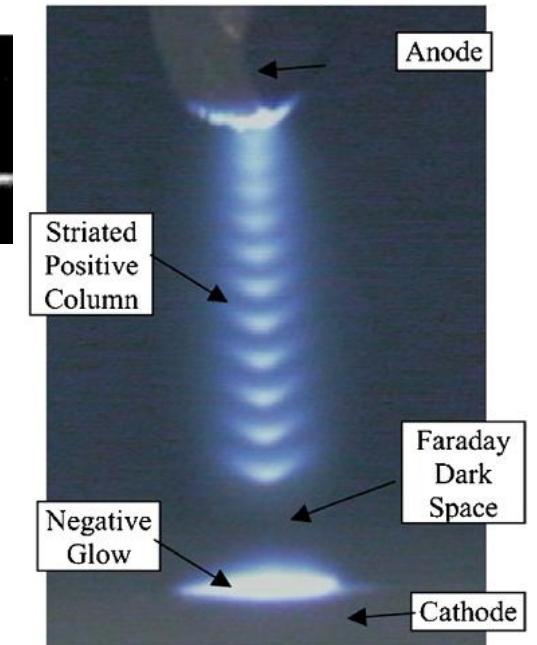
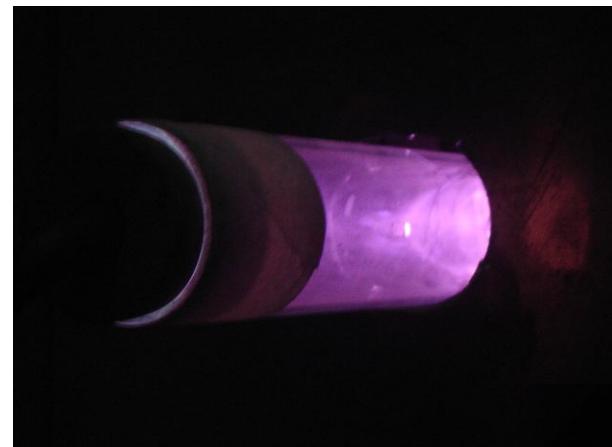
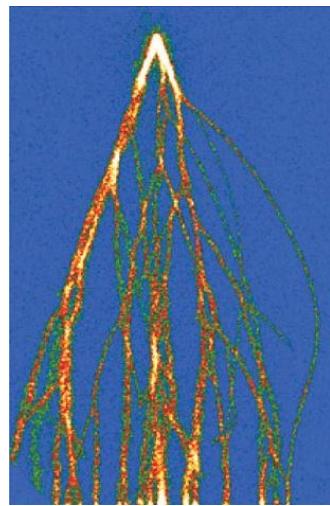
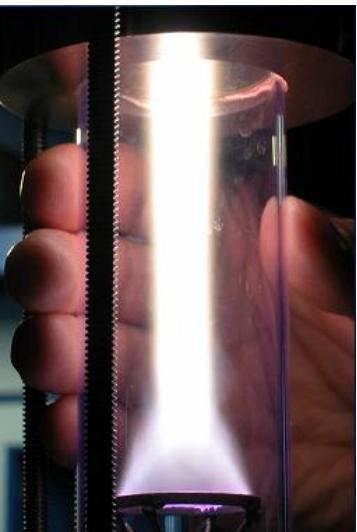
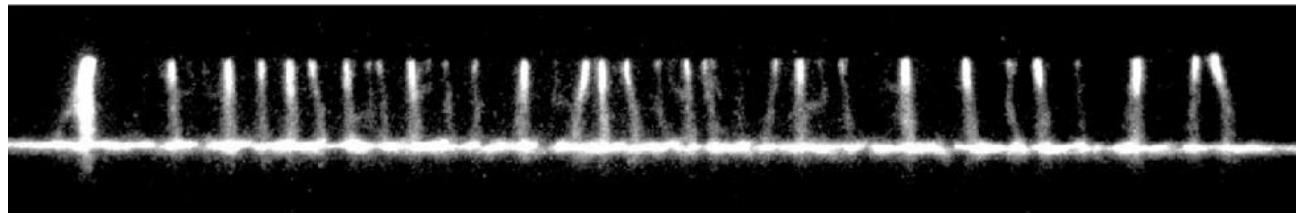
Aplicações



Aplicações



Plasmas

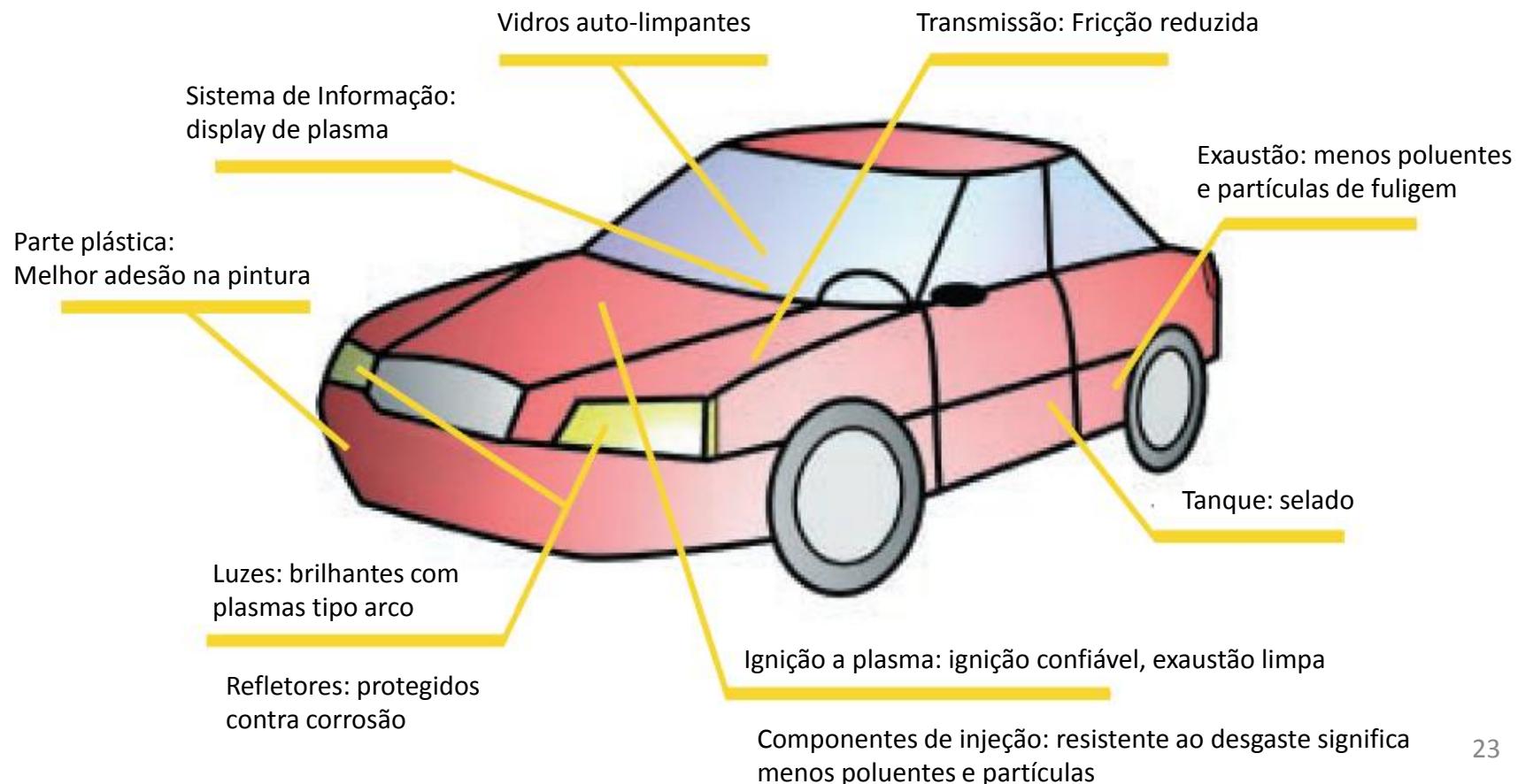


2. Plasma na Engenharia

Automobilistica:

Tecnologias de mobilidade ambientalmente aceitáveis

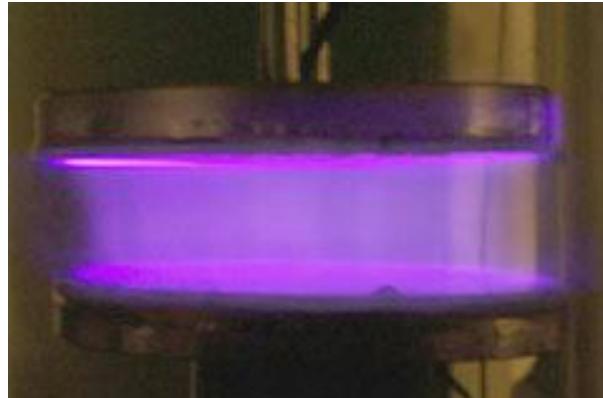
Os fabricantes de automóveis de hoje são obrigados a satisfazer simultaneamente as seguintes exigências:
A maior mobilidade deve ser conciliada com menor consumo de energia e baixas emissões de poluentes. A “Tecnologia de Plasmas” pode atender tal demanda, veja:



Classificação de plasmas: frio e quente



Quente
 $\alpha = 1$



Frio
 $\alpha \ll 1$

Classificação de plasmas: térmico e não-térmico



Térmico
Equilíbrio Termodinâmico local



Não-térmico
Fora do equilíbrio termodinâmico

OBRIGADO

Contato: julio.sagas@udesc.br