

Chapter 4: Plasmas

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1 Introduction

Plasmas light up when energy from line radiation is in the optical range, sort of like burning metals. However, flames light up because of blackbody radiation, which is different. However, flames can still ionize air molecules up to a certain degree, like plasmas (but weaker). There are a wide range of values that they can take, e.g. $n < 1\text{cm}^{-3}, T \approx 1\text{K}$ to $n \geq 10^{26}\text{cm}^{-3}, T \approx 10^{11}\text{K}$.

Plasma is usually created from gases. It can be produced by

- Electron impact ionization
- Ion impact
- Fast neutral
- X-rays, lasers, etc
- Others, see Dolan 49, 50

It can be destroyed by

- Volume Recombination
 - Radiative recombination Where ions and electrons combine to form a neutral, releasing $E = h\nu$
 - 3-body recombination Two electrons and an ion collide, producing an electron and a neutral
- Surface Recombination Charged particles are attracted to a surface, where they recombine