

9 : GAS & DUST IN GALAXIES

(9.1) Galaxy ISMs: An Overview

(9.2) ISM Components & Observational Signatures

- (a) Introduction
- (b) Observational Signatures: General Considerations
- (c) Warm Ionized Gas
 - (i) Hydrogen Recombination Radiation
 - (ii) Collisionally Excited Fine Structure Lines
- (d) Hot Ionized Gas
- (e) Warm & Cold Atomic Gas
- (f) Molecular Gas
- (g) Dust
- (h) Relativistic Component

(9.3) Theories of the Multi-Phase ISM

(9.4) Gas in Disk Galaxies

(9.5) Gas in Elliptical Galaxies

(9.6) Gas in Galactic Nuclei

(9.7) Gas in Galaxy Halos

(9.8) Dust: Particles in the ISM

- (a) Overview
- (b) Quick Estimates of Important Properties
 - (i) Hydrogen Column for Significant Dust Opacity
 - (ii) Dust Number Density
 - (iii) Dust Temperature
 - (iv) Dust Emission Efficiency
- (c) The Importance of Dust
- (d) The Path Ahead

(9.9) Dust: Physical Properties

- (a) Dust Composition from ISM Gas Depletion
- (b) Dust Creation
- (c) Subsequent Growth & Destruction of Grains
- (d) Dust Grain Size Distribution
- (e) Interaction with Light: Mie Theory

- (f) Dust Temperatures**
 - (i) Inferred from IR Emission**
 - (ii) Equilibrium T_d Estimates**
 - (iii) Thermal Spikes from Single Photons**

(9.10) Dust: Emission & Absorption

- (a) Line & Band Features**
- (b) Dust Absorption**
 - (i) Basic Scenario**
 - (ii) Standard Extinction Law**
 - (iii) Some Other Parameters**
 - (iv) Variations in the Extinction Law**
 - (v) Correcting for Reddening & Extinction**
 - (vi) Gas to Dust Ratios**
 - (vii) X-Ray Absorption**
 - (viii) Polarization**

(9.11) Dust Emission from Galaxies

- (a) Absorption of Light**
 - (i) Inclination Effects**
 - (ii) Perpendicular Opacity of Disks**
 - (iii) Hidden Star Formation**
- (b) Emission: Broad Band SEDs**
 - (i) Four Contributions to the FIR**
 - (ii) Other Factors Affecting the IR Output**
 - (iii) Variation Along the Hubble Sequence**
 - (iv) Starbursts**
 - (v) AGN**
- (c) Emission: Spectral Features**