

0.1 Myr

**Grains of Dust & Ices**

- **Grains:**  $\leq \mu\text{m}$
- **Ice:**  $\leq \mu\text{m}$
- **Grains of Dust & Ices:**  $\leq \mu\text{m}$

**Phase 1 - Hit & Stick**

• **Phase 1 - Hit & Stick:**  $\leq \text{mm}$

**Fractal Agglomerates**

- **Fractal Agglomerates:**  $\leq \text{mm}$

**Phase 2 - Sticking with Compaction**

**Porous Agglomerates**

- **Porous Agglomerates:**  $\leq \text{mm}$

**Phase 3 - Growth to the Bouncing Barrier**

**Pebbles**

- **Pebbles:**  $\text{mm} - \text{dm}$

**Sticking**

**Bouncing**

**Fragmentation**

**Mass Transfer**

**Coagulation**

**Evolution**

**Pre Concentration**

**Streaming Instability**

**Gravitational Instability**

**Large Planetesimals**

- **Large Planetesimals:**  $\geq 100 \text{ km}$

**Small Planetesimals**

- **Small Planetesimals:**  $\leq 100 \text{ km}$

Protoplanetary Disk

1-10 Myr

Gas Depletion

10 Myr

**Radiogenic Heating by SLN**

**A: Undifferentiated**

- **A: Undifferentiated:**  $\leq 1 \text{ km}$

**B: Differentiated**

- **B: Differentiated:**  $\geq 1 \text{ km}$

**Radiogenic Heating by LLN**

**Collisions**

**1: Sub-Catastrophic**

**2: Catastrophic**

**3: Super-Catastrophic**

**Type A1**

- **Type A1:** Icy Pebble

**Type B1**

- **Type B1:** Ice-depleted Pebble

**Type A2**

- **Type A2:** Icy Rubble/ Pebble Pile

**Type B2**

- **Type B2:** Ice Shell

**Type A/B3**

- **Type A/B3:** Non-Icy Rubble Pile

Debris Disk

4.6 Gyr

Legend: Icy Pebbles Ice-depleted Pebbles Ice Shell Non-Icy Rubbles