P203a The surprisingly low carbon mass in the debris disk around HD 32297

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Debris disks are the extrasolar analogues of the Solar System's Kuiper belt. They consist of small bodies (asteroids or comets) and dust, and can be seen as leftover products of the planet formation process. Thus, debris disks can help to constrain planet formation theories. Recently, more and more debris disks with a CO gas component have been detected. The CO gas is thought to be secondary, i.e. produced from evaporation or outgassing of colliding cometary bodies. By studying the gas, we can infer the composition of the comets and study their evolution. This might help to understand how comets might deliver volatiles such as water to newly formed planets.

We present ALMA observations of neutral carbon gas (C I) emission from the CO-rich debris disk around the 15–30 Myr old A-type star HD 32297. The observed carbon is produced from CO photodissociation. We develop a simple model of the gas production and destruction in the disk. The surprisingly low C/CO ratio implies that C has to be removed from the system on a short timescale by an unknown process. Furthermore, the required CO production rate exceeds expectations from simple models of the gas production from comets. We propose a possible scenario to meet these peculiar conditions: rapid removal of C by condensation onto dust grains, followed by CO production on the grain surface and rerelease to the gas phase (i.e. CO recycling). This picture could be applied to other CO-rich debris disks and might help to elucidate their origin and evolution.