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# Molecule formation in core-collapse supernova ejecta: the impact of effective matter mixing based on 3D hydrodynamical models of SN 1987A

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It is considered that molecules and dust are formed in the ejecta of core-collapse supernovae (CCSNe); how molecules are formed in CCSN ejecta, however, has not been elucidated yet. SN 1987A found at Large Magellanic Cloud entered a phase of a young supernova remnant more than 30 years after the discovery. Recent ALMA observations (Abellán et al. 2017) have, actually, revealed 3D distributions of carbon monoxide (CO) and silicon monoxide (SiO), which are rather non-spherical and lumpy. The distribution of seed atoms in CCSN ejecta, which is affected by matter mixing before the molecule formation, may play a role in the formation of molecules. Hence, to investigate the impact of matter mixing on the formation of molecules in the CCSN ejecta, time-dependent rate equations for chemical reactions are solved (arXiv:2305.02550) for one-zone and one-dimensional ejecta models of SN 1987A based on three-dimensional hydrodynamical models (Ono et al. 2020). It is found that the mixing of $^{56}$Ni could play a non-negligible role in both the formation and destruction of molecules, in particular CO and SiO, through several reaction sequences. Some of the results and how $^{56}$Ni, practically $^{56}$Co, affects the formation and destruction of molecules are presented.

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