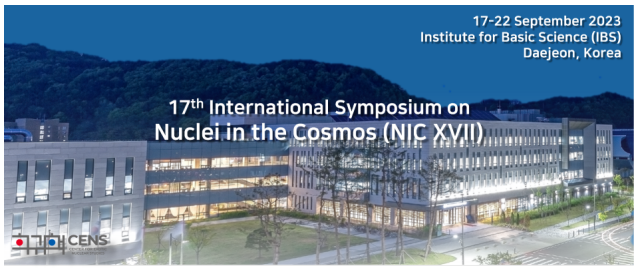

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Molecule formation in the ejecta of SN 1987A: the impact of effective matter mixing based on 3D hydrodynamical models

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More than 30 years after the discovery of SN 1987A, it entered a phase of a young supernova remnant. It is considered that molecules and dust are formed in the ejecta. Actually, recent ALMA observations (Abellán et al. 2017) have revealed that the 3D distribution of carbon monoxide (CO) and silicon monoxide (SiO) is rather non-spherical and lumpy. However, how molecules are formed in core-collapse supernovae has still been unclear. The distribution of seed atoms in the ejecta of SN 1987A, which is affected by matter mixing before the molecule formation, may play a role in the formation of molecules. Therefore, in order to investigate the impact of matter mixing on the formation of molecules in the ejecta of SN 1987A, 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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