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The Stellar Abundances for Galactic Archaeology (SAGA) Database II - Implications for Mixing and Nucleosynthesis in Extremely Metal-Poor Stars and Chemical Enrichment of the Galaxy

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We discuss the characteristics of known extremely metal-poor (EMP) stars in the Galaxy using the Stellar Abundances for Galactic Archaeology (SAGA) database (Suda et al. 2008, PASJ, 60, 1159).The analyses of carbon-enhanced stars in our sample suggest that the nucleosynthesis in AGB stars can contribute to the carbon enrichment in a different way depending on whether the metallicity is above or below [Fe/H] ~ -2.5, which is consistent with the current models of stellar evolution at low metallicity. We find the transition of the initial mass function at [Fe/H] ~ -2 in the viewpoint of the distribution of carbon abundance and the frequency of carbon-enhanced stars. For observed EMP stars, we confirmed that some, not all, of observed stars might have undergone at least two types of extra mixing to change their surface abundances. One is to deplete the lithium abundance during the early phase of red giant branch. Another is to decrease the C/N ratio by one order of magnitude during the red giant branch phase. Observed small scatters of abundances for alpha-elements and iron-group elements suggest that the chemical enrichment of our Galaxy takes place in a well-mixed interstellar medium. We find that the abundance trends of alpha-elements are highly correlated with each other, while the abundances of iron-group elements are subject to different slopes relative to the iron abundance. This implies that the supernova yields of alpha-elements are almost independent of mass and metallicity, while those of iron-group elements have a metallicity dependence or mass dependence with the variable initial mass function.The occurrence of the hot bottom burning in the mass range of 5 <~ M / Msun <~ 6 is consistent with the initial mass function of the Galaxy peaked at ~ 10 - 12 Msun to be compatible with the statistics of carbon enhanced stars with and without s-process element (truncated)

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