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Constraining the neutron-capture nucleosynthesis from surface chemical composition of chemically peculiar stars: some highlights from our recent studies

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Among the chemically peculiar metal-poor stars, the two sub-classes of carbon-enhanced metal-poor (CEMP) stars, the so called CEMP-s and CEMP-r/s stars are powerful tracers of slow (s) and intermediate (i) neutron-capture nucleosynthesis, evolution of binary systems and mechanisms of mass-transfer. The epoch of the earliest s-process nucleosynthesis that influenced the chemical enrichment, as well as questions related to production sites and production mechanisms of i-process nucleosynthesis, that are currently far from being clearly understood can be investigated using these and related stars through accurate and precise measurements of elemental abundances of heavy elements covering a wide range of masses and metallicity. However, to understand the complex mechanisms underlying the nucleosynthesis and evolution of heavy elements a holistic approach integrating observation, theories and simulations is necessary. Some recent results obtained from our chemodynamical studies of a sample of chemically peculiar stars will be presented in the light of companion low-mass,
low-metallicity AGB stars'contribution to the chemical enrichment of heavy elements. Many details associated with the early nucleosynthetic enrichment events that remain poorly understood can be probed with the newly discovered rare pristine objects, the oldest stars believed to be associated with the first supernovae. In this context, some areas where follow-up spectroscopic studies would make an impact will be discussed.

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