

# Nuclei in the Cosmos (NIC XVII)



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## Nucleosynthesis in the tellurium-xenon region

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A detailed analysis of nucleosynthesis in the environment of xenon ( $Z=54$ ) may provide a valuable insight into the interior of stars. The stable isotopes of xenon are produced in a variety of astrophysical environments. The different combinations of nucleosynthetic pathways are:  $\gamma$ -process for  $^{124}\text{Xe}$  and  $^{126}\text{Xe}$ ,  $\gamma$ - and s-processes for  $^{128}\text{Xe}$ ,

s-process for  $^{130}\text{Xe}$ , s- and r-processes for  $^{129}\text{Xe}$ ,  $^{131}\text{Xe}$  and  $^{132}\text{Xe}$ , and r-process only for  $^{134}\text{Xe}$  and  $^{136}\text{Xe}$ .

The isotopic composition of Xe observed in different solar system bodies is used as a genetic mark to identify the origin of volatiles on Earth, however, the stellar origin of the many of the observed nucleosynthetic fingerprints is not known.

The xenon isotopic composition has not been observed only in the solar system material. Xenon isotope abundances have been measured also in different types of presolar grains, e.g., in silicon carbide grains and in nano-diamonds, where the contribution of single nucleosynthesis components can be measured.

We present in this work new experimental results relevant for the p-process nucleosynthesis in the Xe region. Reaction rates of  $^{118}\text{Te}(p,\gamma)$ , as well as reaction rates for  $^{124}\text{Xe}(p,\gamma)$ , have been measured in an energy region close to the gamow window.

The performed nucleosynthesis studies include core-collapse supernovae and TP-AGB stars. We study the impact of our preliminary results on the p-process nucleosynthesis of Xe in core-collapse supernovae. In the second part of this work, we discuss the s-process nucleosynthesis in Asymptotic Giant Branch stars for the isotopes of the xenon region.

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