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## Impact of the $\gamma$ -Ray Strength Functions on the $^{138}\text{La}$ and $^{139}\text{La}$ Galactic Production

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**Abstract content (Max 300 words) <br> <a href="http://events.saip.org.za/getFile.py?target="\_blank">Formatting & Special chars</a>**

The odd-odd neutron-deficient  $^{138}\text{La}$  is very long-lived but one of the less abundant nuclei in the solar system. It is expected to be one of 35 p-nuclei. Most p-nuclei with  $A > 110$  are thought to be produced by photodisintegration from s- and r- process seed nuclei. However, this photodisintegration cannot satisfactorily explain the observed abundance of  $^{138}\text{La}$  and more exotic processes such as the electron neutrino capture on  $^{138}\text{Ba}$  have been called for to explain its synthesis [1,2]. The neutrino reactions can to some extent explain the observed abundance of  $^{138}\text{La}$  but the significance of the photodisintegration process cannot be ruled out due to the limited knowledge and uncertainties of nuclear properties entering the  $^{138}\text{La}$  production, such as the nuclear level densities (NLD) and  $\gamma$ -ray strength function ( $\gamma\text{SF}$ ) [2]. These are critical model input parameters for the astrophysical reaction rate calculations.

Measurements are necessary to place the nuclear properties on a solid footing in order to make statements regarding the importance of neutrino reactions.

In this presentation I will discuss our recently measured NLD and  $\gamma\text{SF}$  of  $^{138}\text{La}$ ,  $^{139}\text{La}$ . These quantities were measured using the  $^{139}\text{La}(^3\text{He}, ^3\text{He}\gamma)^{139}\text{La}$  and  $^{139}\text{La}(^3\text{He}, \alpha\gamma)^{138}\text{La}$  reactions with a 38 MeV  $^3\text{He}$  beam at the Cyclotron Laboratory of the University of Oslo. From particle- $\gamma$  coincidences, measured using the SiRi array (64 silicon channels from particle telescopes) and CACTUS array (26 NaI detectors), the NLD and  $\gamma\text{SF}$  were simultaneously extracted. Moreover, I will also discuss  $^{137}\text{La}(n,\gamma)$  and  $^{138}\text{La}(n,\gamma)$  cross sections and astrophysical rates, calculated with the combinatorial plus Hartree-Fock-Bogoliubov model of NLD and using our experimental  $\gamma\text{SF}$  as input parameters, and address the astrophysical implications.

[1] S.E. Woosley et al., Ap. J. 356, 272 (1990).

[2] S. Goriely et al., A&A 375, 35 (2001).

**Apply to be considered for a student award (Yes / No)?**

Yes

**Level for award (Hons, MSc, PhD)?**

PhD

**Main supervisor (name and email) and his / her institution**

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**Would you like to <br> submit a short paper <br> for the Conference <br> Proceedings (Yes / No)?**

No

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