

# Searching for Alpha-Cluster States in $^{126}\text{Te}$

Saturday, 18 February 2023 11:15 (15 minutes)

Clustering in nuclei provides an alternative description to their nuclear structure in addition to the Nuclear Shell Model. Although alpha ( $^4\text{He}$  nucleus) clusters are widely accepted to be essential to the understanding of the structure of light nuclei, such as the Hoyle state in  $^{12}\text{C}$ , it was experimentally observed in heavy nuclei only recently in  $^{212}\text{Po}$ . The observation showed that  $^{212}\text{Po}$  had mixed shell and cluster configurations, where the structure of  $^{212}\text{Po}$  could be explained by an alpha cluster coupled to the doubly-magic  $^{208}\text{Pb}$  core. In particular, the clustering structure resulted in enhanced  $E1$  (electric dipole) transitions from non-natural parity states, which were measured using gamma-ray spectroscopy.

Another recent experiment at INFN Legnaro observed an excess cross section for the parasitic  $^{122}\text{Sn}(^{13}\text{C}, ^9\text{Be})^{126}\text{Te}$  reaction. Because the fusion-evaporation cross section for this channel was negligible in PACE4 calculations, the  $^{126}\text{Te}$  was likely populated through an alpha transfer reaction which suggests alpha-clustering in its structure. In this experiment gamma rays were detected with the GALILEO array which is composed of 25 Compton-suppressed HPGe detectors while charged particles with particle identification were detected in the EUCLIDES  $E - \Delta E$   $4\pi$  Si-ball array. Gamma-ray spectroscopy with coincidence techniques, such as particle-particle, particle-gamma, and gamma-gamma, is underway to extract previously unobserved transitions and levels in  $^{126}\text{Te}$  from this data set. Preliminary results from the Legnaro data, together with plans for a future experiment, will be presented and discussed.

## Supervisor

Corina Andreoiu

## Funding Agency

NSERC

## Supervisor Email

caa12@sfu.ca

## Your Email

twa73@sfu.ca

**Primary authors:** ANDREOIU, Corina (Simon Fraser University); WU, Frank (Tongan) (Simon Fraser University); ORTNER, Kevin (Simon Fraser University); SPAGNOLETTI, Pietro (Simon Fraser University)

**Presenter:** WU, Frank (Tongan) (Simon Fraser University)

**Session Classification:** February 18 Morning Session

**Track Classification:** Nuclear Structure