The Search for Shape Coexistence in $^{179}$Au

by

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• Nuclei exhibits different shapes within small energy range.
• Shell gap = stabilising
• Residual interactions between nucleons = increase in correlation energy

A.N. Andreyev et. al Letters to Nature 186Pb
- $^{179}$Au has odd number of protons
- Proton coupled to $^{178}$Pt core
- Hole coupled to $^{180}$Hg core
Experimental Set-up

- Germanium array at target position
- Coupled with SAGE spectrometer
- RITU gas filled separator
- GREAT spectrometer at focal plane.

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SAGE Spectrometer

Silicon Detector

Target Position

High Voltage Barrier

Carbon Foil

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Experimental details

• $^{82}\text{Kr} + ^{100}\text{Ru} \rightarrow ^{182}\text{Hg}$

• Fusion evaporation reaction

• 3 particle exit channel (p2n)
Gamma ray spectra

- Spectrum gated on 153 keV
- Recoil gated
Level scheme

- Some rearrangement at low spin
Systematics

![Graph showing excitation energy vs neutron number N for different isotopes of Au. The graph highlights energy levels for specific states such as $25/2^+$, $21/2^+$, $17/2^+$, and $13/2^+$.]
Using SAGE: electron – gamma coincidences

Recoil tagged spectrum, gated on 262 keV gamma ray.
Using BRICC calculator:
138 keV electron is K electron associated with 220 keV transition.
Using SAGE:

Recoil tagged spectrum, gated on 262 keV gamma ray.

![Graph showing counts versus energy with a peak at 269 keV]
Using BRICC calculator: 269 keV electron is K electron associated with 350 keV transition.
Summary

• This work has produced a $^{179}$Au level scheme in agreement with literature.
• Demonstrated validity of electron-gamma coincidences.
• Future work will include analysing and understanding electron spectra
  - E0 transitions
  - Conversion coefficients
  - Fine structure

Thank You
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