EXPERIMENTAL B(E2, $0^+ \rightarrow 2^+$) FOR EVEN Xe ISOTOPES

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Measurements of B(E2, $0^+ \rightarrow 2^+$) for five even Xenon isotopes were performed at the Uppsala Tandem accelerator Laboratory. Spectra of backscattered α-particles of an initial energy of 10-13 MeV were recorded in an annular surface barrier detector. The de Boer-Winther program |1| was then used to analyze the experimentally obtained ratios of inelastically to elastically scattered particles. The B(E2)-values were extracted assuming a vanishing quadrupole moment for the 2^+ state, but with errors increased to allow for oblate or prolate moments of magnitude $\lesssim$ the rotational value. The effect of virtual excitations of higher lying levels was not considered as the matrix elements connecting

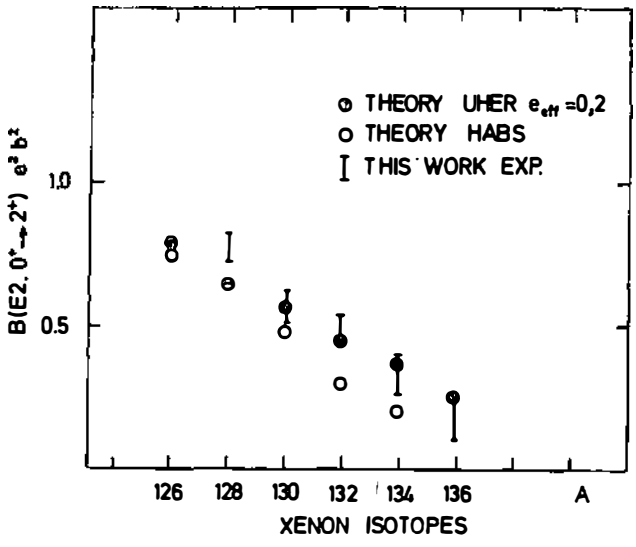

Fig.1. Comparison of experimental results with theory.

TABLE

A	N	E(2+) (keV)	B(E2) $e^2x10^{-48}cm^4$	τ (ps)	Method	B(E2) theory ref.4*	B(E2) theory ref.3	Q(2+) ref.3	Q(2+) theory** ref.14	Ref.
120	66	321.8	1.84(22)	124(15)	γLS				+0.86	13
122	68	331.5	2.21(20)	89 (8)	γLS				+0.80	13
124	70	354.1	0.90 (7)	81 (7)	$^{16}O\gamma$				+0.77	7
126	72	388.5	0.76 (3)	59.6(20)	TM	0.788	0.75	-0.13	+0.63	8
			0.79 (6)	58 (5)	$^{16}O\gamma$					7
128	74	442.9	0.69 (5)	35 (3)	$^{16}O\gamma$	0.644	0.65	-0.29		7
			0.96	13 (3)	NFR/$^{16}O\gamma$					9,10
			0.79 (4)	29.9(15)	$\sigma(\theta_\alpha)$					present
130	76	538.0	0.69(15)	13.3(24)	NFR	0.564	0.48	-0.05		9
			1.00(8)	9.2(7)	^{16}O					7
			0.76(20)	12.0(30)	TM					12
			0.58(5)	15.5(14)	$\sigma(\theta_\alpha)$					present
132	78	667.8	0.30(14)	9.7(30)	NFR	0.448	0.30	-0.01		11
			0.45	6.8	NFR/$^{16}O\gamma$					9,10
			0.44(3)	7.0(6)	$^{16}O\gamma$					7
			0.50(4)	6.1(5)	$\sigma(\theta_\alpha)$					present
134	80	(854)	0.34(6)	2.9(5)	$\sigma(\theta_\alpha)$	0.370	0.20	+0.13		present
136	82	1313.3	0.18(8)	0.58(26)	$\sigma(\theta_\alpha)$	0.254				present

TABLE CAPTION

Summary of experimental and theoretical results for B(E2) and Q_{2^+} of even Xenon isotopes.

The formula (or its inverse)

$$B(E2, 0^+ \to 2^+) = \frac{4.08 \cdot 10^{-13}}{[E_{2^+}(\mathrm{MeV})]^5 \cdot \tau(\mathrm{s}) \cdot (1+\alpha)} \quad (e^2 b^2)$$

was used.

The shorthand notations for the different experimental methods are as follows:

γLS τ obtained from lineshape analysis of Doppler-shifted γ lines.

NFR Nuclear resonance fluorescence. Level-width determined.

$^{16}O\gamma$ Excitation cross-section determined from rate of coincidence between back-scattered ^{16}O ions and deexcitation gammas.

$\sigma(\theta_\alpha)$ Excitation cross-section from spectrum of back-scattered alpha particles.

TM Time measurement with coincidence technique.

* From ref. |4| B(E2) for $e_{eff} = 0.2$ was chosen.

** From ref. |14| Q_{2^+} corresponding to the most favourable deformation energy was chosen.

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such levels are not known. The quantum mechanical correction to the cross-section is of the order of 0.3% according to an estimate by Alder |2| and was therefore omitted.

The results given in the figure and the table are weighted averages of measurements performed at α-energies 10-12 MeV. For completeness, other experimental results known to us are included in the table. The agreement is satisfactory. Two theoretical predictions |3,4| are shown

in the figure. Both theories reproduce the decrease in B(E2) as the closed neutron shell is approached.

(Details of the experiments can be found in a local report |5|. In separate experiments, $g(2^+)$ were determined for $^{126,128,130,132}Xe$ |6|.)

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