	experimental				theoretical				
	Cu1	Cu2	Ag1	Ag2	CuIV	CuVI	AgIV	AgVI	
b'	0,52	0,46	0,55	0,71	0,72	1,14	1,07	1,57	$\cdot 10^{-20}$
$-c'$	0,51	0,48	0,54	0,70	0,73	1,17	1,00	1,05	m^6/A^2s^2
d'	0,95	0,83	0,64	1,01	1,27	1,52	1,47	1,44	
$-c'/b'$	0,98	1,03	0,99	0,98	1,01	1,02	0,94	0,67	
d'/b'	1,84	1,79	1,17	1,41	1,77	1,33	1,38	0,92	

Table 1.

The experimental and theoretical results agree remarkably well, especially for copper, as far as the anisotropy of the magnetoresistance is concerned although the band structure is not sufficiently well known. The absolute values of the magnetoresistance coefficients, however, agree within a factor of 2 only.

There is a certain discrepancy between the absolute values observed for different samples, indicating that KOHLER's rule does not hold strictly. This may arise from the assumption of an isotropic relaxation time being not fully justified. However, there is also experimental evidence that the local resistivity varies to some extent within the crystal leading to improper absolute values but leaving the ratios unaffected to the first order approximation. For the two silver crystals, even these ratios differ appreciably. The reason is, probably, that the condition of a low magnetic field is less well satisfied than for the copper crystals.

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Polarization of 15.85-MeV Neutrons Scattered by Carbon

G. MACK and G. MERTENS

Physikalisches Institut der Universität Tübingen, Deutschland

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Polarization measurements for elastic and inelastic scattering of neutrons from nuclei are of considerable interest for the understanding of nucleon-nucleus interaction and of nuclear reactions. Especially at energies above 10 MeV, where compound elastic effects are small, the nuclear optical model is suited to describe nucleon polarization very well. But because of experimental difficulties in this energy range reliable neutron polarization measurements are very scarce.

Numerous measurements of elastic scattering from carbon exist in the neutron energy range below 8.5 MeV. At higher energies a measurement at 24 MeV of the angular distribution of the elastic polarization has been made [1], and at 14.7 MeV measurements of asymmetry [2] and polarization [3] have been published, where however elastic and inelastic scattering were not separated.

Therefore in the present experiment the neutron polarization has been measured at $E_n = 15.85$ MeV for $^{12}C(n,n)^{12}C$ and $^{12}C(n,n')^{12}C$ ($Q = -4.43$ MeV). The measurements, briefly reported in [4], have been made by determining the scattering asymmetry of polarized incident neutrons. The d-t reaction was used. The deuterons of a VAN DE GRAAFF accelerator struck a Ti-^{3}H target which had an effective thickness of 280 keV, the mean deuteron energy within the target was 1.90 MeV. The neutrons, emitted at $\Theta_{lab} = 70.0°$ relative to the direction of the deuteron beam, had a mean energy of 15.85 MeV. At a distance of 100 cm they hit the carbon scatterer. This was a cylindrical plastic scintillator NE 102 A with a diameter of 3.82 cm and a height of 10.16 cm, with its axis perpendicular to the scattering plane. The neutrons scattered from carbon nuclei in the scintillator at angles $\pm\Theta$ were simultaneously detected by two scintillation counters A and B at the end of two time-of-flight paths with a length of 300 cm each.

In order to avoid instrumental asymmetries the scattering angles to the left and to the right were made equal very carefully. During the measurements the position of the focus on the target could be controlled remotely and corrected at any time with an accuracy of ± 0.3 mm. The whole uncertainty of the mean scattering angles to the left and to the right was ± 2 minutes.

The scintillations produced by carbon nuclei are very faint. Within the range of scattering angles $\Theta_{lab} = 30°$ to $80°$ the recoil energies lie between 0.33 and 2 MeV. The scintillation efficiency is about 1.6% relative to electrons of the same energy [5, 6]. Therefore the scintillation pulses of the carbon nuclei are equivalent to electron pulses of 5.3 to 32 keV. If time-of-flight measurements are to be made with pulses of this height it is necessary to suppress multiplier noise in order to reduce the background caused by chance coincidences. This was done by mounting one multiplier 56 AVP on each end of the scattering scintillator. The pulses of the anodes were fed into a fast coincidence circuit. The output pulses of it mainly come from scintillations while statistical independent noise pulses of the two multipliers cause chance coincidences only.

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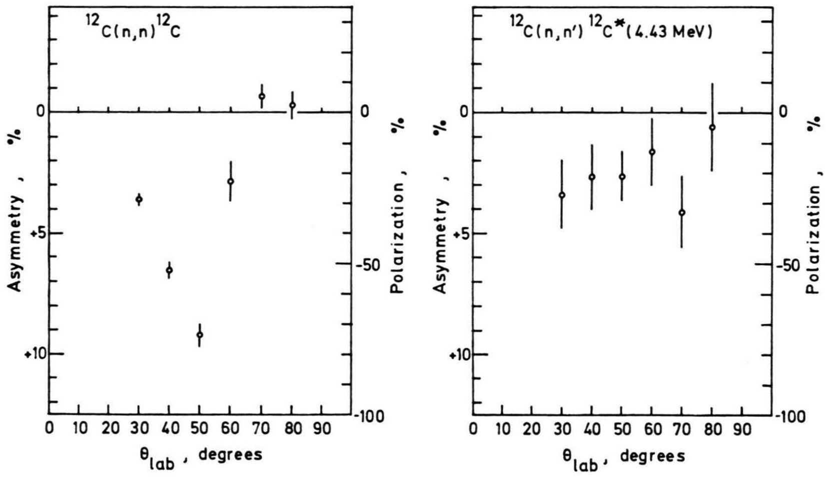

Fig. 1. Scattering asymmetries and preliminary polarization values for elastic and inelastic scattering. The neutron energy was $E_n = 15.85$ MeV.

The asymmetry measurements were made with the aid of two time to pulse height converters. The two time-of-flight spectra from the left and from the right were simultaneously fed into the signal input of a 512 channel analyzer and were stored in the two memory halves. The logical elements of the electronics were carefully constructed so that on no account falsifications of the spectra could occur by piling up of pulses or by mutual influencing of the two sides.

During the asymmetry measurements the detectors A and B were exchanged in periods of 80 min at the most. These periods of exchange were short enough to avoid instrumental asymmetries which might have been caused by drifting of the electronics. The scintillation counters were temperature stabilized. The stability of the apparatus was tested with γ-γ coincidences.

In Fig. 1 the scattering asymmetries in % are plotted. The given errors are the statistical ones only. All asymmetries have been corrected for dead time effects, for asymmetries caused by the anisotropy of the d-t neutron emission and for final height of scatterer and detectors. Systematic errors caused by inaccuracies of the geometrical setup are at the most of the order of the statistical errors at all angles. The right scale in Fig. 1 shows the scattering polarization in % under the assumption that the spin flip probability in the case of inelastic scattering would be zero. But the polarization scales must be regarded as preliminary since there is no measurement of the neutron polarization from the d-t reaction for the deuteron energy of 1.90 MeV. The assumed value for primary neutron polarization of −12.5% results from an interpolation between the measurements of CHRISTIANSEN et al. [7] at 2.1 MeV and of LEVINTOV et al. [8] at 1.8 MeV. Apart from that those polarization values are still based on the n-α scattering phases of SEAGRAVE [9]. The primary polarization for $E_d = 1.90$ MeV is being measured at the present time with our setup. A high pressure He-gas scintillator is used. These measurements which will be evaluated with the new scattering phases of HOOP and BARSCHALL [10] will be published as well as final values for scattering polarization from carbon.

The instrumental asymmetry was measured for all angles either by scattering of the neutrons from protons of the scattering scintillator or by scattering of unpolarized neutrons from carbon. The asymmetries from n-p scattering were corrected for the small polarization at 16 MeV. In the case of the scattering from carbon elastically and inelastically scattered neutrons were used together for the calculating of the asymmetry.

Table 1 shows a compilation of the results. The letters given in brackets in the column of the instrumental asymmetry indicate the used scattering nuclei.

Θ_{lab} (degrees)	Asymmetries from scattering on Carbon, (%) elastic	inelastic	Instr. Asymmetry %
30	$+3.6 \pm 0.3$	$+3.4 \pm 1.4$	-0.3 ± 0.3 (p)
40	$+6.5 \pm 0.4$	$+2.7 \pm 1.4$	-0.5 ± 0.3 (p)
50	$+9.3 \pm 0.5$	$+2.6 \pm 1.0$	$+0.6 \pm 0.4$ (p)
60	$+2.8 \pm 0.8$	$+1.6 \pm 1.4$	$+0.1 \pm 0.3$ (p)
70	-0.7 ± 0.5	$+4.1 \pm 1.5$	-0.2 ± 0.4 (C)
80	-0.3 ± 0.6	$+0.5 \pm 1.8$	0.0 ± 0.4 (C)

Table 1. Compilation of the measured asymmetries.

Shortly we will report in detail about the experimental setup and the results.

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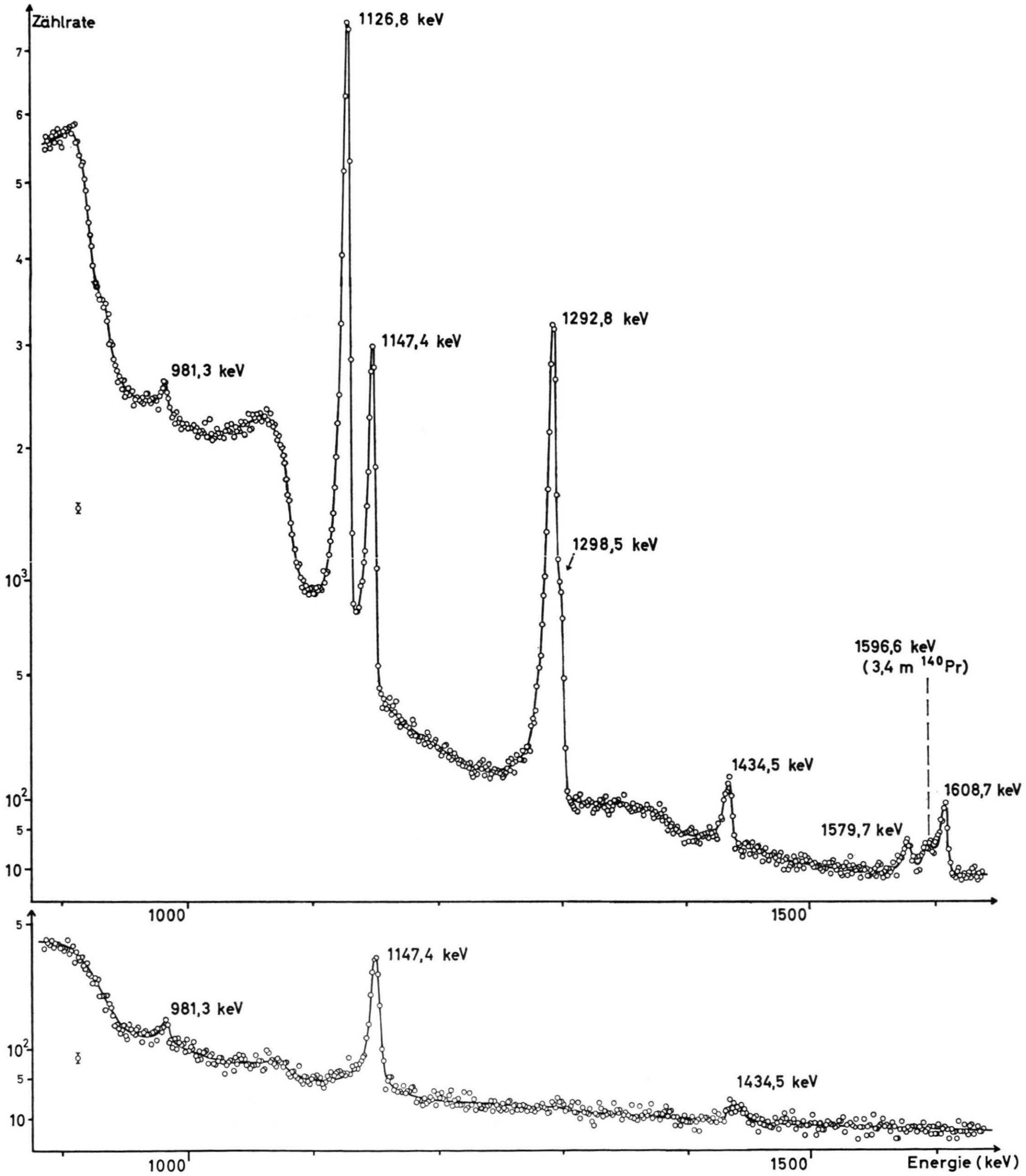

Abb. 1. Oberer Teil: Einzelspektrum; unterer Teil: Koinzidenzspektrum mit der 145 keV-Linie. Der Ordinatenmaßstab entspricht der Quadratwurzel aus der Zählrate. Damit wird erreicht, daß der statistische Fehler der Meßpunkte überall gleich groß ist.

Messungen zum Termschema von ^{141}Pr

K. Hesse und K. Wien

Institut für Technische Kernphysik der Technischen Hochschule Darmstadt

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In addition to the first excited state (at 145.4 keV), the following levels of ^{141}Pr have been determined from the γ-spectrum of ^{141}Nd : 1126.8; 1292.8; 1298.5; 1579.8 and 1608.7 keV. Possible assignments of spin and parity are given.

Experimentelle Arbeiten über das Termschema von ^{141}Pr befaßten sich bisher vor allem mit dem ersten angeregten Zustand [1] bei 145,4 keV. Über die höheren Zustände liegen nur verhältnismäßig wenige, zum Teil widersprüchliche Daten vor [2–8]. Da dieser Kern auf Grund seiner abgeschlossenen Neutronenschale $N=82$ von Interesse ist, erschien eine erneute Untersuchung des Zerfalls von ^{141}Nd, bei dem das Termschema von ^{141}Pr bevölkert wird, sinnvoll.

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