Abb. 2 zeigt die gemessene und die nach (2) berechnete spektrale Intensitätsverteilung für einen festen Wert $i\,p_0$.

In dem von der experimentellen Anordnung (Monochromator mit SEV-Registrierung) erfaßten Bereich besteht eine zufriedenstellende Übereinstimmung zwischen Theorie und Experiment. Die eingetragenen Meßpunkte stellen Mittelwerte dar, wobei der angegebene Streubereich auch die Unsicherheit der relativen spektralen Empfindlichkeitskurve der Meßanordnung enthält. Im Bereich $\lambda \gtrsim 6000$ Å wurde wegen der dort auftretenden Störung durch Linien keine Kontinuumsmessung ausgeführt.

Bereits die hier für Neon angeführten Ergebnisse lassen die Schlußfolgerung zu, daß entgegen der bisherigen Annahme das Kontinuum der Mitteldrucksäule im sichtbaren Bereich ein Bremskontinuum für Elektronen-Atom-Stöße darstellt. Dieses bisher nur im Ultraroten beobachtete Kontinuum [5, 7] tritt hier unter einfachen Beobachtungs- und Betriebsbedingungen auf und bietet günstige Möglichkeiten der weiteren Untersuchung elementarer Prozesse in Plasmen.

On the Nature of the Electron Traps in Alkaline Ice

H. Barzynski and D. Schulte-Frohlinde

Kernforschungszentrum Karlsruhe, Institut für Strahlenchemie

(Z. Naturforschg. **22 a**, 2131—2132 [1967]; eingeg. am 4. November 1967)

We have investigated the influence of the preparation of alkaline ice samples on the formation of trapped electrons on γ-irradiation. Sodium hydroxide forms several stable hydrates $NaOH \times (H_2O)_n$ $(1/2 \leqq n \leqq 7)$ [1]. We prepared crystalline transparent $NaOH \times 7\ H_2O$ (9.0 ml/l, single crystals), $NaOH \times 3.5\ H_2O$ (14.5 mol/l, crystals of $0.5-3.0$ mm ϕ) and $NaOH \times 1\ H_2O$ (30 mol/l, single crystals) and transparent glassy samples with alkali concentrations equivalent to $NaOH \times 7\ H_2O$ and $NaOH \times 3.5\ H_2O$ and compared their behaviour.

Fig. 1 a shows the formation of the blue colour due to trapped electrons ($\lambda_{max} = 585 m\mu$) as a function of the dose in glassy and crystalline samples of $NaOH \times 3.5\ H_2O$ at -196 °C. Exactly the same results were obtained with $NaOH \times 7\ H_2O$. $NaOH \times 1\ H_2O$ does not form a glass. The results show that the appearance of the blue colour is strong only in the amorphous matrices. A similar effect is found in polycrystalline methanol * and ethanol (Fig. 1 b) and in the sodium perchlorate-ice system [2]. The ratio of total spin concentrations of irradiated (dose: 2.5×10^{19} eV/g) crystalline and glassy $NaOH \times 3.5\ H_2O$ is roughly 1 : 15, showing that not only the colour, but also the yield of products in the amorphous sample is much higher. When heated the irradiated colourless crystalline sodium hydroxides turn red. The origin of this colour, however, is not a

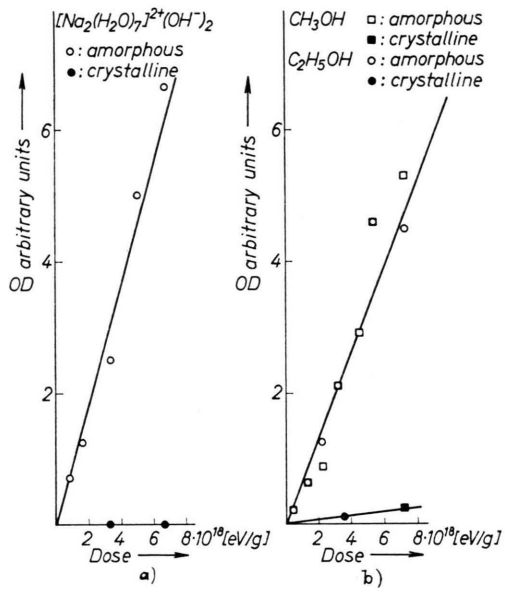

Fig. 1. Relative optical density (OD) at 585 mμ of glassy and crystalline transparent $NaOH \times 3.5\ H_2O$, methanol, and ethanol as a function of dose. Co-60-γ-rays, $T = 77$ °K (measured by comparison with colour standards).

trapped electron.

Mainly four models have been proposed concerning the nature of the trapping site: The electron should occupy

1) an expanded orbital of a metal cation [3],
2) an expanded orbital of an O^--radical ion [4, 5],
3) an anion vacancy formed during the absorption process [6–8],

[1] Gmelins Handbuch der anorganischen Chemie, Verlag Chemie, Weinheim/Bergstr., 8. Auflage, System Nr. 21, Erg. Bd. Lfg. 2 (1965), p. 847.

* Similar results in methanol were obtained by J. Janovsky and J. Teply (in press).

[2] B. G. Ershov, A. K. Pikaev, P. I. Glaszunov, and Y. Spytsin, Dokl. Akad. Nauk. SSSR **149**, 363 [1963].

[3] J. Jortner and B. Sharf, J. Chem. Phys. **37**, 2506 [1962].

[4] P. N. Moorthy and J. J. Weiss, in "Solvated Electrons", Advances in Chemistry Series **50**, American Chemical Society, Washington, D. C. 1965, p. 180.

[5] P. N. Moorthy and J. J. Weiss, Phil. Mag. **10**, 659 [1964].

[6] M. J. Blandamer, L. Shields, and M. C. R. Symons, Nature, London **199**, 902 [1963].

[7] L. Kevan, in: Progress in Solid State Chemistry, Vol. 2, Pergamon Press, New York 1965, p. 304.

[8] M. J. Blandamer, L. Shields, and M. C. R. Symons, J. Chem. Soc. **1964**, 4352.

4) a cavity or defect of considerable size (Hohlraum), which should be present in larger numbers in an amorphous system than in a crystal [9–11]. The importance of the amorphous phase has been pointed out also by Russian workers [12] (For the details of the models, see original papers).

It is generally accepted that the first model cannot explain the experimental results obtained by electron spin resonance and absorption spectroscopy [6, 7, 11, 13]. With respect to the other three mechanisms, only model 4 seems to require a strong matrix dependence: Electrons should be more easily trapped in an amorphous matrix where more cavities and defects of suitable sizes are present than in a crystalline matrix where the degree of order is much higher. In general, model 4 requires defects in the material to be present before ionization. The binding energy of the traps should be a function of the size and the arrangement of the matrix molecules.

It is not possible to apply models 2 and 3 on pure alcoholic systems to explain the formation of electron traps, because the concentration of anions is to small. Hence, in alcoholic systems only model 4 can be applied. Therefore, and because of the similarity in the behaviour of the aqueous and the alcoholic systems we are in favor of the "defect or cavity" model as the best description of the trapping sites for trapped electrons in alkaline ice.

[9] K. Eiben and D. Schulte-Frohlinde, Z. physik. Chem. N.F., **45**, 20 [1965].
[10] D. Schulte-Frohlinde and K. Eiben, Z. Naturforschg. **17 a**, 445 [1962].
[11] D. Schulte-Frohlinde, Proceedings of the Rad. Research Society Meeting in Cortina (1966), North Holland Publishing Company, Amsterdam 1967, p. 251.
[12] V. N. Belevskii and L. T. Bugaenko, Russ. J. Phys. Chem. **39**, 1580 [1965].
[13] L. Kevan, J. Am. Chem. Soc. **87**, 1481 [1965].

BERICHTIGUNGEN

Zu H. Richter und H. Oehme, Struktur von geschmolzenem Natrium bei 110° und 525 °C, Z. Naturforschg. **22 a**, 1470 [1967].

Die Abbildungen 1 und 2 sind zu vertauschen.

Zu H. Faissner, Charge Distributions According to the Cluster Model of Nuclear Fission, Z. Naturforschg. **21 a**, 1021 [1966].

The formula [Eq. (3)] for the statistical probability of obtaining k protons out of the z surplus protons, when drawing n of the a surplus nucleons, was incorrectly reproduced in the manuscript. It should have read:

$$W_{nk} = \binom{n}{k} \frac{z}{a} \frac{z-1}{a-1} \cdots \frac{z-k+1}{a-k+1} \cdot \frac{a-z}{a-k} \frac{a-z-1}{a-k-1} \cdots \frac{a-z-(n-k)+1}{a-n+1} . \tag{3}$$

Consequently, three lines below Eq. (3) it should read:

"factors of the type $(a-z-\mu)/(a-k-\mu)$".

All computations were done using the correct formula.

The author wants to thank Prof. Süssmann for drawing his attention to this error.

Verantwortlich für den Inhalt: A. Klemm
Satz und Druck: Konrad Triltsch, Würzburg