In Connection with the Paper of Arifov, Aiukhanov and Starodubtsev[1]

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IN the paper of Arifov, Aiukhanov and Starodubtsev[1], on the question of the decrease of the number of atoms adsorbed on a surface due to a rise in temperature, the following statement occurs: "As an example of such incorrect interpretations of the role of temperature we will cite one of the recent works of Eremeev[2], in which it is affirmed that the coefficient of secondary emission of electrons, due to ionic bombardment, diminishes with an increase in the temperature of the target". However, any reader can discover entirely different statements in my paper, namely, that at target temperatures which are not too high, the target becomes covered with ions adsorbed from the primary beam, so that, as the temperature of the target increases, the number of liberated electrons decreases at the same time that the number of particles adsorbed by the target also decreases. For some reason the authors of the paper in reference 1 remain silent on this point, even though they use these results immediately in their work.

During the last three years much has become known about the process of interactions of ions with surfaces and much has become precise as a result of the applications of the more recent methods of investigation, but the adsorption of ions from the primary beam and the dependence of electron emission (from the adsorbing layer) upon the target have not encountered further objection. It was possible to assume beforehand, that for hard targets this emission does not vanish completely with the increasing depth of the adsorbing layer, which in fact has been confirmed experimentally.

Translated by D. G. Posin
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[1] U. A. Arifov, A. Kh. Aiukhanov and S. V. Starodubtsev, J. Exper. Theoret. Phys. USSR 26, 714 (1954)

[2] M. A. Eremeev, Doklady Akad. Nauk SSSR 79, 5 (1951)

The Degree of Orientation of Nuclei

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1. THE preparation of targets with oriented nuclei is of considerable interest to nuclear physics. Through experiments with oriented nuclei it is possible to obtain valuable information regarding spin dependence of nuclear forces, spins and magnetic moments of radioactive nuclei, etc. (see reference 1).

We shall limit ourselves to the examination of the most important case in which the quantization of the nuclear spin is axially symmetric. In this case the degree of orientation of the nuclear spins is usually described quantitatively by the values f_k, expressed as follows[2]:

$$f_k = \frac{(2I-k)!}{(2I)!}\sum_m a_m \tag{1}$$

$$\times\left[\sum_{\nu=0}^{k}(-1)^{\nu}\frac{(I-m)!\,(I+m)!}{(I-m-\nu)!\,(I+m-k+\nu)!}\binom{k}{\nu}^{2}\right].$$

where m = projection of the nuclear spin on the axis of quantization, I = maximum projection, a_m = relative population of states having spin projection equal to m, k takes on values 1, 2, . . . $2I$. The quantities f_k are normalized in such a way as to make the maxima of their absolute values equal to one. In particular, we have (the bar denoting the average over all the nuclei of a given type in the sample),

$$f_1 = \overline{m}\,/\,I, \tag{2}$$

$$f_2 = \frac{3}{I(2I-1)}\left[\overline{m^2} - \frac{1}{3}I(I+1)\right], \tag{3}$$

$$f_3 = \frac{5}{I(I-1)(2I-1)}\left[\overline{m^3} - \frac{1}{5}(3I^2+3I-1)\,\overline{m}\right], \tag{4}$$

$$f_4 = \frac{35}{2I(I-1)(2I-1)(2I-3)} \tag{5}$$

$$\times\left[\overline{m^4} - \frac{1}{7}(6I^2+6I-5)\,\overline{m^2} + \frac{3}{35}I(I-1)(I+1)(I+2)\right].$$

In the works of references 3, 4, f_1 and f_2 have been computed for different methods of production of oriented nuclei. However, in the above researches, a case is considered for which the differences in the energies of states corresponding to various m are much smaller than kT, i.e., a case