$F\bar{F}$ production is suppressed relative to $D\bar{D}$ production by the factor $(m_u/m_s)^{4+a}$, where a represents the mass dependence implicit in the wave function. A quadratic potential gives $a=1$, while $a=\frac{2}{3}$ for a linear potential.

Thus, if the charmed mesons are treated as nonrelativistic bound systems, it is possible to make definite and reasonably consistent predictions concerning charm production in the threshold region.

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[5]This form of the potential neglects and $^3S_1$-$^3D_1$ mixing, which is generally quite small.

Remarks on Rotational-Energy Contributions to the Kinetic Energies of Deep Inelastic Reaction Products*

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It is pointed out that unambiguous division of kinetic energies of deep inelastic reactions products into contributions from rotational and Coulomb energy cannot be made from measurements of the fragment energies at a single bombarding energy.

Recently, evidence has been suggested for a significant contribution of rotational energy to the final fragment kinetic energies in the deep inelastic scattering of $^{32}S+^{50}Ti$ [1] and $^{20}Ne+^{27}Al$.[2] For the system $^{32}S+^{50}Ti$, the measured dependence of the total kinetic energy on fragment mass could not be explained by neglecting the influence of rotational energy at the moment of scission and by assuming Coulomb repulsion of two charged spheres, only. However, it was pointed out in Ref. 1 that a quantitative evaluation of Coulomb and rotational energy contributions is ambiguous because of the uncertain shape of the composite system at the scission point and the unknown final channel angular momentum of relative motion.

In this Comment, we want to point out that the same ambiguities are present in the analysis of Ref. 2. Furthermore, results of a measurement of the final fragment kinetic energies for different bombarding energies are presented for the system $^{35}Cl+^{27}Al$. Since the Coulomb energy contribution to the fragment kinetic energy is beam energy independent, the observed energy dependence in the reaction $^{35}Cl+^{27}Al$ gives a much more direct measure of the rotational energy contribution.

The evidence of Ref. 2 is based on Fig. 1. The different contributions to the final kinetic energies have been calculated as

$$E = Z_1 Z_2 e^2/d + f^2\hbar^2 L^2/2\mu d^2 + V_{\text{nucl}}, \quad (1)$$

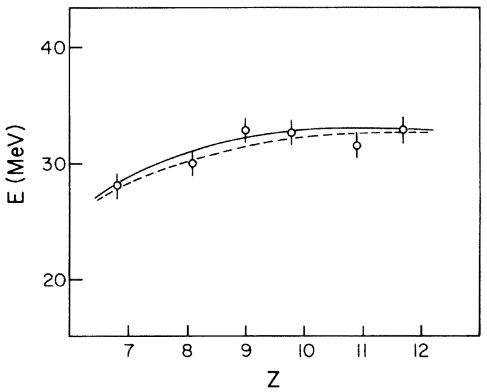

FIG. 1. Total kinetic energies for deep inelastic fragments observed in the bombarding of ^{27}Al by ^{20}Ne. Data are from Ref. 2. Solid line is the prediction of Eq. (1) with $r_0=1.79$ fm; dashed line is the prediction of Eq. (3) with $r_0=1.04$ fm.

with

$$f = \mu d^2/(\mu d^2 + J_1 + J_2). \quad (2)$$

Here Z_1 and Z_2 are the fragment atomic numbers, L is the (entrance channel) angular momentum, $\mu = A_1A_2/(A_1+A_2)$ is the reduced mass, $J_{1,2}$ are the moments of inertia of the separated fragments, and d is the distance of separation between the mass centers at scission, i.e., $d = r_0(A_1^{1/3} + A_2^{1/3})$. A nuclear interaction is added to obtain the final kinetic energy E. The use of Eq. (2) to calculate the angular momentum of relative motion at scission implies infinitely strong tangential friction, i.e., sticking of the two fragments. A value of $L = 35\hbar$ has been used yielding a value of $d = 10.2$ fm from a fit of Eq. (1) to the data for symmetric fragmentation.

Although both assumptions $L = 35\hbar$ and the sticking model appear reasonable, they are not to be considered as established knowledge for reactions such as the present one. In order to indicate the range of assumptions reproducing the data of Ref. 2, the final kinetic energy has been calculated by assuming pure Coulomb repulsion of the fragments, i.e.,

$$E = Z_1Z_2e^2/[r_0(A_1^{1/3} + A_2^{1/3})], \quad (3)$$

where $r_0 = 1.04$ fm and $A = 2Z$ for the light fragment, in accordance with Ref. 2. The results are compared to the data as dashed lines in Fig. 1. It is obvious that Eq. (3) describes the data equally well as Eq. (1).

We may conclude that although the interpretation of Ref. 2 is reasonable, the data are completely consistent with a description of the process in terms of Coulomb energy alone, i.e., without invoking any rotational energy contribution. Note also that $r_0 = 1.04$ fm is equal to the critical[3] radius parameter $r_0^c \approx 1.04$ fm (see below). Since processes like deep inelastic scattering are believed to occur for distances corresponding to $r_0 \gtrsim r_0^c$, the parametrization of Eq. (3) also seems reasonable.

Having shown that data at one energy are insufficient to allow a determination of rotational energy contributions to the final channel kinetic energies in deep inelastic scattering, we want to briefly discuss results of an experiment on the beam energy dependence of E. In this experiment, ^{27}Al targets have been bombarded by ^{35}Cl ions at four lab energies ($140 \leq E_L \leq 170$ MeV). The experiment was performed with the ^{35}Cl beam of the tandem facility of Brookhaven National Laboratory. Fragments with $5 < Z < 17$ have been identified and their energies recorded. It is illustrated in Fig. 2 that the final channel kinetic energies are completely damped as is implied by the constancy of the energies with respect to scattering angle. Further details of this experiment will be published elsewhere.[4] Here we concentrate on the dependence of the final channel kinetic energy on beam energy for various fragments. Since in Eq. (1) L is the entrance channel angular momentum, we may write

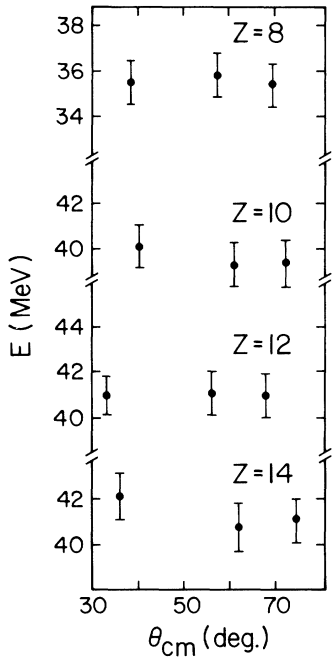

FIG. 2. Dependence of the final channel kinetic energies on scattering angle for ^{35}Cl + ^{27}Al at $E_{lab} = 160$ MeV. Data are not corrected for particle evaporation.

$$\alpha = dE/dE_i = f^2R_c^2\mu_c/d^2\mu. \quad (4)$$

Here, R_c is the critical radius as extracted from the measured[5] fusion cross sections of ^{35}Cl + ^{27}Al, $R_c = 1.04(A_1^{1/3} + A_2^{1/3})$, μ_c is reduced mass in the initial channel, and E_i is the entrance channel energy. For Eq. (4) to be valid we have assumed that the cross section for deep inelastic scattering is mainly determined by a few partial waves centered around $L = L_c$, the critical angular momentum.[4]

In Fig. 3, the quantity α as extracted from the data[6] is plotted for different fragment charges Z and compared to the prediction of Eq. (4). Note first that for all Z, $\alpha \neq 0$. This definitely excludes interpretation of the data via Eq. (3) which would predict $\alpha = 0$. Since the radius parameter r_0 for the calculation of d is determined[4] to be

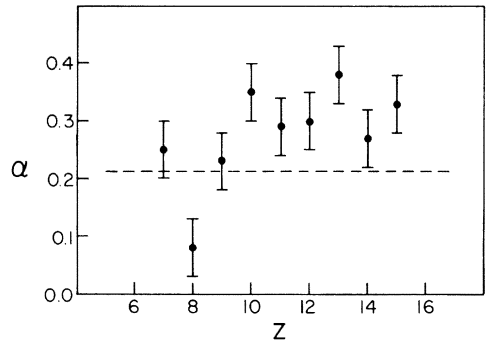

FIG. 3. Experimental values of the variation $\alpha = dE/dE_i$ of the final channel kinetic energies on beam energy for the reaction $^{35}Cl + ^{27}Al$. Dashed line is the prediction of Eq. (4) based on the rigid rotation model. Parameters are as given in the text.

$r_0 = 1.62$ fm by fitting Eq. (1) to the experimental final channel energies, Eq. (4) introduces no free parameter. The resulting calculated values of α (dotted line in Fig. 3) are in fair agreement with the data although deviations do occur, especially for large values of Z, indicating the possibility that the classical model or rigid rotation underlying Eq. (4) may not always be fulfilled. It should be mentioned that in the present analysis the distance d is assumed to be independent of energy. It is believed that the present model does not justify a more sophisticated treatment of the scission radius d. It is also clear from Fig. 3 that the main energy dependence of the final kinetic energies for all fragments is accounted for without assuming an energy-dependent scission radius.

In conclusion, we have demonstrated that analysis of fragment kinetic energies in deep inelastic scattering yields ambiguous results concerning the question of rotational energy contributions when data at only one beam energy exist. These ambiguities can be nearly fully removed when the beam energy dependence is analyzed as has been shown for the case of $^{35}Cl + ^{27}Al$.

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[6]For the determination of α, the experimentally observed fragment kinetic energies have been used. The effect of particle evaporation from the fragments on the kinetic energies has been estimated via evaporation calculations and found to be less than 10% for all observed fragments. It is not included in the experimental α values of Fig. 2.

Rayleigh Scattering and Critical Dynamics at Structural Phase Transitions in Perovskites

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It is shown that light scattering from phonon density flucutations recently reported by Lyons and Fleury should have a critical depolarized component in systems such as $SrTiO_3$ near the 105°K transition. Its size is calculated on the basis of available neutron-scattering, specific-heat, and birefringence data. It is concluded that with an appropriate experimental arrangement this component could become observable.

Lyons and Fleury have recently reported on light-scattering observations of dynamic central peaks in $KTaO_3$ and $SrTiO_3$.[1] They observed two strongly polarized quasielastic features which they attributed to entropy fluctuations and two-phonon processes, respectively. Reflecting on their own results the authors mention possible connection with the ubiquitous central peak of structural phase transitions.[2] The present Comment points out that the coupling between order-parameter fluctuations and refractive index should indeed contribute to the two-phonon quasielastic peak in systems such as $SrTiO_3$ around the 105°K structural phase transition. This contribution, that arises from fluctuations in the optical anisotropy, will be depolarized. Its strength can be estimated from available data and will be compared to the strength of the usual Rayleigh peak caused by entropy fluctuations. Remarks will be made about the expected angular dependence and spectrum.

It is known that in systems such as $SrTiO_3$ the