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## THE ENERGY TRANSFER PROCESS [MATH]

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THE ENERGY TRANSFER PROCESS  $N(^4S) + N(^4S) \xrightarrow{(M)} N_2 \xrightarrow{XeF_2} XeF(B) + N_2(X) + F$

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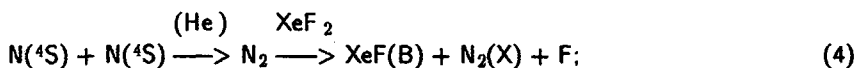
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We have found out the energy transfer process from the excited nitrogen molecules formed in the nitrogen atoms recombination to the  $XeF_2$  molecules leading to the  $XeF(B)$  eximer formation:



(here  $N_2^* = N_2 (A^3\Sigma_u^+, B^3\Pi_g, B^1\Sigma_u^-, W^3\Delta_u; v)$ .)

Preliminary studies have shown that: 1. reaction (2) rate constant is close to gas-kinetic one; 2. the chemiluminescence intensity is proportional to square of the nitrogen atoms concentrations and helium concentration. Therefore reaction



may be characterized by thermolecular constants  $k_4 = I_{XeCl} / [N]^2 [He]$  photon  $cm^6 / particle^3 s$ .

Addition of xenon to helium increases the  $k_4$  values, probably, due to energy transfer  $N_2^* \longrightarrow Xe^* \longrightarrow XeF$  process having higher than reaction (2) efficiency. After various type of calibrations it has been possible for us to estimate the  $k_4$  values:  $k_4 > 1.5 \cdot 10^{-34} cm^6/s$  ( $p_{He} = 4 - 12$  Torr),  $> 4.5 \cdot 10^{-34} cm^6/s$  ( $p_{He} = 4.4$  Torr,  $p_{Xe} = 0.5$  Torr). Comparison of these rate constants with the reaction (1) and (5) ones



( $k_1 = 1 \cdot 10^{-33} cm^6/s$ ,  $k_5 = 5 \cdot 10^{-33} cm^6/s$ , see [1] and references in it) shows fairly high efficiency of the reactions (1-3). One can suppose that these processes are interesting enough for chemical  $XeF$  laser creation.

[1] A.M.Pravilov, L.G.Smirnova, A.F.Vilesov J.Photochem. and Photobiol.

A:Chem. (in press).