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

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 $cm^6/particle^3s$.

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.

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