

Radiation-induced transformations of isolated
CH₃CN molecules in noble gas matrices

Svetlana V. Kameneva, Anastasia D. Volosatova,
Vladimir I. Feldman



PII: S0969-806X(17)30693-X
DOI: <http://dx.doi.org/10.1016/j.radphyschem.2017.08.011>
Reference: RPC7616

To appear in: *Radiation Physics and Chemistry*

Received date: 12 July 2017
Revised date: 9 August 2017
Accepted date: 14 August 2017

Cite this article as: Svetlana V. Kameneva, Anastasia D. Volosatova and Vladimir I. Feldman, Radiation-induced transformations of isolated CH₃CN molecules in noble gas matrices, *Radiation Physics and Chemistry*, <http://dx.doi.org/10.1016/j.radphyschem.2017.08.011>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Radiation-induced transformations of isolated CH₃CN molecules in noble gas matrices

Svetlana V. Kameneva, Anastasia D. Volosatova, Vladimir I. Feldman *

Department of Chemistry, Lomonosov Moscow State University, 119991 Moscow, Russia

Abstract

The transformations of isolated CH₃CN molecules in various solid noble-gas matrices (Ne, Ar, Kr, and Xe) under the action of X-ray irradiation at 5 K were investigated by FTIR spectroscopy. The main products are CH₃NC, CH₂CNH and CH₂NCH molecular isomers as well as CH₂CN and CH₂NC radicals. The matrix has a strong effect on the distribution of reaction channels. In particular, the highest relative yield of keteneimine (CH₂CNH) was found in Ne matrix, whereas the formation of CH₃NC predominates in xenon. It was explained by differences in the matrix ionization energy (IE) resulting in different distributions of hot ionic reactions. The reactions of neutral excited states are mainly involved in Xe matrix with low IE, while the isomerization of the primary acetonitrile positive ions may be quite effective in Ne and Ar. Annealing of the irradiated samples results in mobilization of trapped hydrogen atoms followed by their reactions with radicals to yield parent molecule and its isomers. The scheme of the radiation-induced processes and its implications for the acetonitrile chemistry in cosmic ices are discussed.

Keywords: matrix isolation; acetonitrile; X-ray irradiation; FTIR spectroscopy

* Corresponding author; e-mail: feldman@rc.chem.msu.ru (V.I. Feldman)

Download English Version:

<https://daneshyari.com/en/article/5499014>

Download Persian Version:

<https://daneshyari.com/article/5499014>

[Daneshyari.com](https://daneshyari.com)