

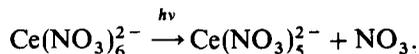
Reactions of nitrate radical with amino acids in aqueous medium

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The nitrate radical is recognized as an environmentally important radical. Due to the key role played by the nitrate radical in atmospheric chemistry, particularly during night time, its reactions have been extensively studied recently. It is a powerful oxidant, and can promote the oxidation process when the level of other radicals such as OH are at a minimum. It can abstract hydrogen to yield nitric acid and contribute to the acidification of rain water. It can also react with organic species to form toxic and hazardous compounds.

Photochemically the nitrate radical is generated by the reaction



The nitrate radical has a strong optical absorption at 640 nm and this wavelength has been used to monitor the reaction dynamics of amino acids with nitrate radicals.

Nitrate radicals react with amino acids – proline, threonine, hydroxyproline, serine, phenylalanine, 2-amino butyric acid, valine, glutamine, leucine, histidine, arginine – with rate constants in the range of 3×10^3 to $3 \times 10^7 \text{ M}^{-1} \text{ s}^{-1}$. With phenylalanine, a new transient absorption is observed with a maximum at 570 nm, which is characteristic of the phenylalanine cation radical. But in the case of other amino acids, no such new transients are observed. Based on the above observations and the magnitudes of the second-order rate constants, an electron transfer reaction mechanism in the case of phenylalanine and hydrogen abstraction reactions in the case of other amino acids are postulated.

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