DECOMPOSITION OF ZINC AZIDES

By

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CHEMISTRY DEPARTMENT

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C E R T I F I C A T E

This is to certify that the thesis entitled " Decomposition of Zinc Azides" being submitted by Mr. C.R.JAGGA to the Indian Institute of Technology, Delhi for the award of the Degree of Doctor of Philosophy in Chemistry is a record of bonafide research work carried out by him. Mr. C.R.JAGGA has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis, which to my knowledge has reached the requisite standard.

The results contained in this thesis have not been submitted, in part or in full, to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

Kinetics of photochemical and thermal decomposition of zinc azide and zinc hydroxy azide have been studied. Photodecomposition of the two azides of zinc under a high-pressure ultra-violet lamp has been studied as a function of intensity, wavelength and temperature. The pressure-time data of photolysis obey a parabolic rate equation and the rate is a linear function of intensity. Detailed mechanisms embracing the observed intensity- and time-dependence of the rate of photolysis have been presented. Prolonged photolysis of the compounds extending upto several hours at constant temperature and intensity has been studied to understand the details of time-dependence of the rate. The use of cut-off filters has been made to mark out the regions of wavelengths effective in photolysing zinc azides. The photolysis rate of the aged samples is found to be lower than that of the fresh samples. Mechanism of photodecomposition of the two azides is essentially the same and differences in rates are consistent with the difference in the diffuse reflectance spectra and the expected differences in surface areas of the two.

The thermal decomposition of zinc azide and its basic form has been investigated at several temperatures with a view to finding primarily the mode of decomposition in relation to the established topochemical models of solid-state decomposition reactions. The kinetics of thermal decomposition of fresh samples of both the azides are governed by instantaneous nucleation leading to

the unimolecular decay law followed by the contracting volume law at higher degrees of decomposition. The effect of pre-treatment viz. prolonged ageing, pre-heating and pre-irradiation (with γ-rays) on subsequent thermal decomposition of the samples have been exhaustively studied.

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