

STUDIES ON DECOMPOSITION OF AZIDES

**A THESIS SUBMITTED TO THE
INDIAN INSTITUTE OF TECHNOLOGY, NEW DELHI
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN CHEMISTRY**

**R. K. SOOD, M. Sc.
CHEMISTRY DEPARTMENT
AUGUST, 1972**

C E R T I F I C A T E

This is to certify that the thesis entitled "Studies on decomposition of azides" being submitted by Mr. Rameswar Kumar Sood 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. Sood has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis.

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.

S. R. Yoganarasimhan

(S.R. Yoganarasimhan)
Thesis Supervisor.

L. K.
Head, Dept. of Chemistry,
Indian Institute of Technology,
Hauz Khas, New Delhi - 29.

A C K N O W L E D G E M E N T

I record my sincere gratitude to Dr. S.R. Yoganarasimhan, Assistant Professor, Chemistry Department, Indian Institute of Technology, Delhi, for his continued guidance and inspiration throughout the research work. But for his kind help which he rendered me any time, this work would not have been possible.

Thanks are due to Prof. R.D. Dua, Head of the Chemistry Department, Indian Institute of Technology, Delhi, for providing the laboratory facilities. I am grateful to Dr. V. Ramakrishna, Senior Professor, Chemistry Department, Indian Institute of Technology, Delhi, for his persistent encouragement during the course of these investigations.

I would like to thank my colleagues, particularly, Messrs A.N. Pathak, U.S. Tewari, S.K. Syal, N. Kumar, P. Bhatia and R. Sharma, for their assistance and reading the manuscript of the thesis. Cooperation from Mr. P.N. Manon and Mr. B.M. Singhal of the Glass Blowing Workshop, is most appreciated.

Contd....

Fellowship from Council of Scientific and
Industrial Research, New Delhi, during the tenure of
this work is gratefully acknowledged.

I am thankful to Mr. M.T. Samuel for the typ-
ing of the thesis.

Rameshwar Kumar Sood
(Rameshwar Kumar Sood)
Department of Chemistry,
Indian Institute of Technology,
Hauz Khas, New Delhi-29.

C O N T E N T S

	Page
I	Introduction. 1
1.1	General terminology and decomposition curve. 1
1.2	Solid decompositions and role of defects. 3
1.3	Theories of solid decompositions. 9
1.4	Effect of irradiation on solids. 21
1.5	Thermal and photodecomposition of azides. 24
	References. 33
II	Experimentals. 39
2.1	Materials and methods. 39
2.2	Vapor pressure measurements. 40
2.3	Electrical conductivity of zinc azide. 41
2.4	Photolysis of zinc azide. 43
2.5	Thermal decomposition of zinc azide. 48
2.6	Spectra of zinc azide. 50
2.7	Preliminary work. 51
	References. 52
III	Results and discussion. 53
3.1	A new hydrate of zinc azide. 53
3.2	Photolysis of zinc azide. 58
3.2 a	Discussion of photolysis results. 67

3.2 b	Diffusion controlled photolysis rate.	71
3.2 c	Mechanism for the photolysis of zinc azide.	74
3.2 d	Defect structure and rate of photolysis.	79
3.3	Thermal decomposition of zinc azide I and II.	84
3.3 a	Ageing studies on zinc azide I and II.	84
3.3 b	The thermal decomposition of aged samples of zinc azide I and II.	89
3.3 c	Discussion of thermal decomposition results.	105
3.3 d	Thermal decomposition of preheated samples.	111
3.3 e	Thermal decomposition of preirradiated samples.	115
3.3 f	Mechanism of thermal decomposition.	120
3.4	Summary and conclusions.	124
	References.	128
IV	Appendix.	130
