

CONTENTS

Sr. No.	PARTICULARS	Page No.
	Abstract	I-VII
Chapter 1	Introduction	1 - 39
1.1	General	1
1.2	Hazard potential of explosives and explosive contaminants	5
1.3	Conventional modes of disposal and treatment technologies for explosives	7
1.4	Alternative modes of disposal and treatment technologies for explosives	7
	<i>1.4.1</i> Incineration	7
	<i>1.4.2</i> Supercritical water oxidation	8
	<i>1.4.3</i> Molten salt oxidation	9
	<i>1.4.4</i> Wet Air Oxidation	10
	<i>1.4.5</i> Alkaline Hydrolysis	11
	<i>1.4.6</i> Bioremediation	15
	<i>1.4.7</i> Composting	18
	<i>1.4.8</i> Phytoremediation	20
1.5	Explosives selected under the present study	21
	<i>1.5.1</i> Nitrocellulose	21
	<i>1.5.2</i> Nitroglycerine	23
	<i>1.5.3</i> Triple base propellant	23
	<i>1.5.4</i> Trinitrotoluene	24
1.6	Treatment methods selected under the present study	25
	<i>1.6.1</i> Composting	25
	<i>1.6.2</i> Alkaline hydrolysis	26
	<i>1.6.3</i> Phytoremediation	26
1.7	Scope of the present study	27
1.8	Scheme of thesis	28
	References	30 - 39
Chapter 2	Compost bioremediation of nitrocellulose, nitroglycerine, triple base propellant and trinitrotoluene and testing efficacy of compost end products as manure	40 - 94
2.1	Introduction to compost bioremediation	40
	<i>2.1.1</i> Basic principles and process of compost bioremediation	41
	<i>2.1.2</i> Compost bioremediation of explosive contaminants	42
2.2	Materials and Methods	44
	<i>2.2.1</i> Selection of compost fillers	44

	2.2.2	Source of compost fillers	45
	2.2.3	Homogenization of compost fillers for bed preparation	45
	2.2.4	Parameters performed on compost fillers before preparation of compost bed	45
	2.2.5	Compost bed preparation	45
	2.2.6	Composition of high energy materials	45
	2.2.7	Concentrations of test compounds used under study	45
	2.2.8	Compost set up	45
	2.2.9	Composting parameters performed on compost bed after spiking of test compounds	46
	2.2.10	Monitoring of compost parameters	46
	2.2.11	Estimation of NC and TNT in compost extracts by spectrophotometric assays	48
	2.2.12	FTIR, HPLC and GCMS analysis of compost extracts	49
	2.2.13	Experimental set-up for seed germination studies on compost end Products	52
	2.2.14	Determination of Chlorophyll, carbohydrate and protein in wheat plant	52
	2.3	Results and Discussion	54
	2.4	Conclusions	89
		References	90 - 94
Chapter 3		Alkaline hydrolysis of nitrocellulose (NC), triple base propellants (TBP) & trinitrotoluene (TNT) and phytotoxicity assessment of hydrolysates.	95 - 128
	3.1	Introduction	95
	3.2	Materials and Methods	97
		3.2.1 Alkaline hydrolysis of NC, TBP and TNT	97
		3.2.2 Analysis of hydrolysates by ion chromatography	97
		3.2.3 Phytotoxicity test on NC, TBP and TNT hydrolysates	98
		3.2.4 Composting of hydrolysates	100
	3.3	Results and Discussion	101
	3.4	Conclusion	126
		References	127 - 128
Chapter 4		Isolation, characterization and identification of microflora from compost matrices incubated with explosives	129 - 167
	4.1	Introduction	129
	4.2	Materials and Methods	130
		4.2.1 Selection of compost matrices	130

	4.2.2	Determination of CFU count	131
	4.2.3	Isolation of bacteria	131
	4.2.4	Isolation of pure bacterial colony	132
	4.2.5	Isolation of fungi	132
	4.2.6	Slide culture for the isolation of single fungi	132
	4.2.7	Preservation of the isolates	133
	4.2.8	Morphological characterization of the bacterial and fungal isolates	133
	4.2.9	Biochemical characterization of bacterial isolates	134
	4.2.10	Identification of Bacterial isolates using 16srRNA sequencing	134
4.3		Results and Discussion	135
4.4		Conclusion	139
		Tables, Figures, Sequences and Photos	141
		References	164 - 167
Chapter 5		Phytoremediation of Nitroglycerine	168 - 193
5.1		Introduction	168
5.2		Materials and Methods	171
	5.2.1	Selection and collection of plants	171
	5.2.2	Propagation of plants	171
	5.2.3	Experimental set-up	171
	5.2.4	Analysis of biochemical parameters	172
	5.2.5	Analysis of nitroglycerine	175
	5.2.6	Spectral analysis of plant tissue extracts	175
5.3		Results and Discussion	176
5.4		Conclusions	181
		Figures and Photos	182
		References	191 - 193
Chapter 6		Summary	194 - 202
		Publications	203 - 204