

# CONTENTS

	<b>Page No.</b>
<b>List of Tables</b>	<b>vi</b>
<b>List of Figures</b>	<b>vii</b>
<b>List of Abbreviations</b>	<b>ix</b>
<b>Preface</b>	<b>x-xi</b>
<b>1. Introduction</b>	<b>1-7</b>
1.1 Air pollution	<b>1</b>
1.2 Conventional Technologies for VOCs Control and their limitations	<b>4</b>
1.3 VOCs Control by biological Process	<b>4</b>
1.3.1 Biofiltration technology	<b>4</b>
1.3.2 VOCs Control by biotrickling filters	<b>6</b>
1.3.3 VOCs Control by bioscrubbers	<b>7</b>
1.3.4 VOCs Control by membrane bioreactors	<b>7</b>
<b>2. Literature Survey</b>	<b>8-26</b>
2.1 Parameters which affect the performance of any bio filter	<b>8</b>
2.1.1 Pollutant affection with water	<b>8</b>
2.1.2 Packing media	<b>9</b>
2.1.2.1 Natural packing	<b>10</b>
2.1.2.1.1 Compost	<b>10</b>
2.1.2.1.2 Peat	<b>11</b>
2.1.2.1.3 Agro waste	<b>11</b>
2.1.2.1.4 Coal	<b>11</b>

2.1.2.1.5 Soil	11
2.1.2.2 Synthetic/Inert packing media	12
2.1.2.2.1 Granular Activated Carbon (GAC)	12
2.1.2.2.2 PU foam	12
2.1.2.2.3 Pall rings	13
2.1.2.3 Composite media	13
2.1.2.3.1 PVA/Peat/KNO <sub>3</sub>	13
2.1.2.3.2 PVA/Peat/KNO <sub>3</sub> /GAC	14
2.1.3 Temperature	14
2.1.4 Moisture Content	15
2.1.5 PH Value	15
2.1.6 Nutrients Supply	16
2.1.8 Pressure Drop	16
2.1.9 Gas flow rate	17
2.1.9 Kinetic Model	18
2.2 Current Status of Work and Objectives of Research Work	19
<b>3. Method and Material</b>	<b>27-36</b>
3.1 Selection of Packing Media	27
3.2 Selection of Target VOCs	27
3.3 Chemicals and Reagents	30
3.4 Filter media	31
3.5 Inocolumn	31
3.6 Characterization of Filter Media	31
3.6.1 Dry Weight/Mass Measurement	31

3.6.2. Moisture Retention Capacity	31
3.6.3 Bed Porosity	32
3.6.4 Bulk Density	32
3.6.5 CHN Content	32
3.7 Design and Operating Parameters	32
3.8 Biofilter Setup and Operation	33
<b>Results and Discussion</b>	<b>37-80</b>
4. Biodegradation of vapor phase benzene, toluene and xylene (BTX) using Compost based modified biofilter medium	36
4.1 Preparation method of PVA/compost/KNO <sub>3</sub> composite bead	36
4.2 Result and Discussions	37
4.2.1 Physico-chemical characterization results	37
4.2.2 Performance of biofilter under individual loading rates of Benzene, Toluene and Xylene	37
4.2.3 Effect of Inlet Loading Rate on Removal Efficiency and Elimination Capacity	39
4.2.4 Performance of biofilter under combined loading rates of BTX	42
4.2.5 Effect of BTX Loading Rate on Removal Efficiency (RE) and Elimination Capacity (EC)	44
4.3 Kinetic Analysis	45
<b>5. Biodegradation of MEK, Toluene and Xylene (MTX) from Air Using Modified Wood Charcoal Beads as Biofilter Media</b>	<b>49-59</b>
5.1 Preparation of PVA/Wood Charcoal/KNO <sub>3</sub> Composite beads	49
5.2 Result and Discussions	50

5.2.1 Physico-chemical characterization results	<b>50</b>
5.2.2 Performance of biofilter under individual loading rates of MEK, Toluene and xylene	<b>50</b>
5.2.3 Effect of Inlet Loading Rate on Removal Efficiency and Elimination Capacity	<b>53</b>
5.2.4 Performance of biofilter under combined loading rates of MTX	<b>55</b>
5.3 Kinetic Analysis	<b>57</b>
<b>6. Biodegradation of styrene from air using modified Compost composite beads as biofilter media</b>	<b>60-66</b>
6.1 Preparation of PVA/ (Wood Charcoal +compost)/KNO <sub>3</sub> Composite beads	<b>60</b>
6.2 Result and Discussions	<b>61</b>
6.2.1 Physicochemical characterization results	<b>61</b>
6.2.2 Continuous Biodegradation of Styrene Vapour Mixture	<b>61</b>
6.2.3 Effect of Inlet Loading Rate on Removal Efficiency and Elimination Capacity	<b>63</b>
6.3 Kinetic analysis	<b>64</b>
<b>7. Biodegradation of styrene from air using modified Wood Charcol and compost composite beads as modified biofilter media</b>	<b>67-73</b>
7.1 Preparation of PVA/ (compost)/KNO <sub>3</sub> Composite beads	<b>67</b>
7.2 Result and Discussions	<b>68</b>
7.2.1 Physicochemical characterization results	<b>68</b>
7.2.2 Biodegradation of Styrene	<b>68</b>
7.2.3 Effect of Inlet Loading Rate on Removal Efficiency and Elimination Capacity	<b>71</b>

7.3 Microscopic observation	72
<b>8. Comparison of the performance of VOC<sub>s</sub> tested against various modified media</b>	<b>74-75</b>
<b>9. Conclusion and recommendation for future work</b>	<b>76-80</b>
9.1 Conclusion	76
9.2 Recommendation for future work	80
<b>REFERENCES</b>	<b>81-90</b>
<b>APPENDIX</b>	<b>91-102</b>

## **LIST OF PAPERS PUBLISHED/PRESENTED**

## **PERSONAL PROFILE**

\*\*\*\*\*