KABARAK UNIVERSITY
6TH ANNUAL INTERNATIONAL RESEARCH CONFERENCE

CHARACTERIZATION OF FOREST FIRE EMISSIONS AND THEIR POSSIBLE TOXICOLOGICAL IMPACTS ON HUMAN HEALTH

BY

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Introduction

Fire is a complex, dynamic, and physiochemical process and i
the result of rapid chemical reaction generating soot, heat, flar
and light

Soot consists of **particulate matters** (PM), as well as a variet
of invisible combustion gases and vapours suspended in the fi
atmosphere

Particulate matter is the sum of all solid and liquid particles b
organic and inorganic particles such as soot, dust, smoke and
liquid droplets

Introduction cont'd

These particles vary greatly in size, composition and origin

Soot formation, from the perspective of flame modeling, can
viewed as comprised of two principal components:

i) gas-phase chemistry - determines the flame structure

ii) soot particle dynamics - describes the evolution of the par
nsemble

Introduction cont'd

- Forest fire emissions can be classified into spherical organic carbon particles, soot aggregates and inorganic ash particles.
- Research has shown that human inhalation of wood smoke/so affects both systemic and lung biomarkers, suggesting a probable effect of smoke particulates towards cardiovascular diseases

Motivation of the Study

n view of increased forest fires, generation of soot in the nvironment is on the rise.

ince soot has been reported to contain substances that are arcinogenic and/or mutagenic and oxidative stress agents, xposure to the same pose high health risk both to the environm nd humans.

tudies have shown that soot causes decreased lung function, he nd liver problems..

Motivation of the Study

oot exists in the environment in form of PAHs, polyenes and la
drocarbons

ccording to a major study published in New England Journal o
edicine in 2007, long term exposure to urban air pollution
ntaining soot increases the risk of coronary heart diseases.

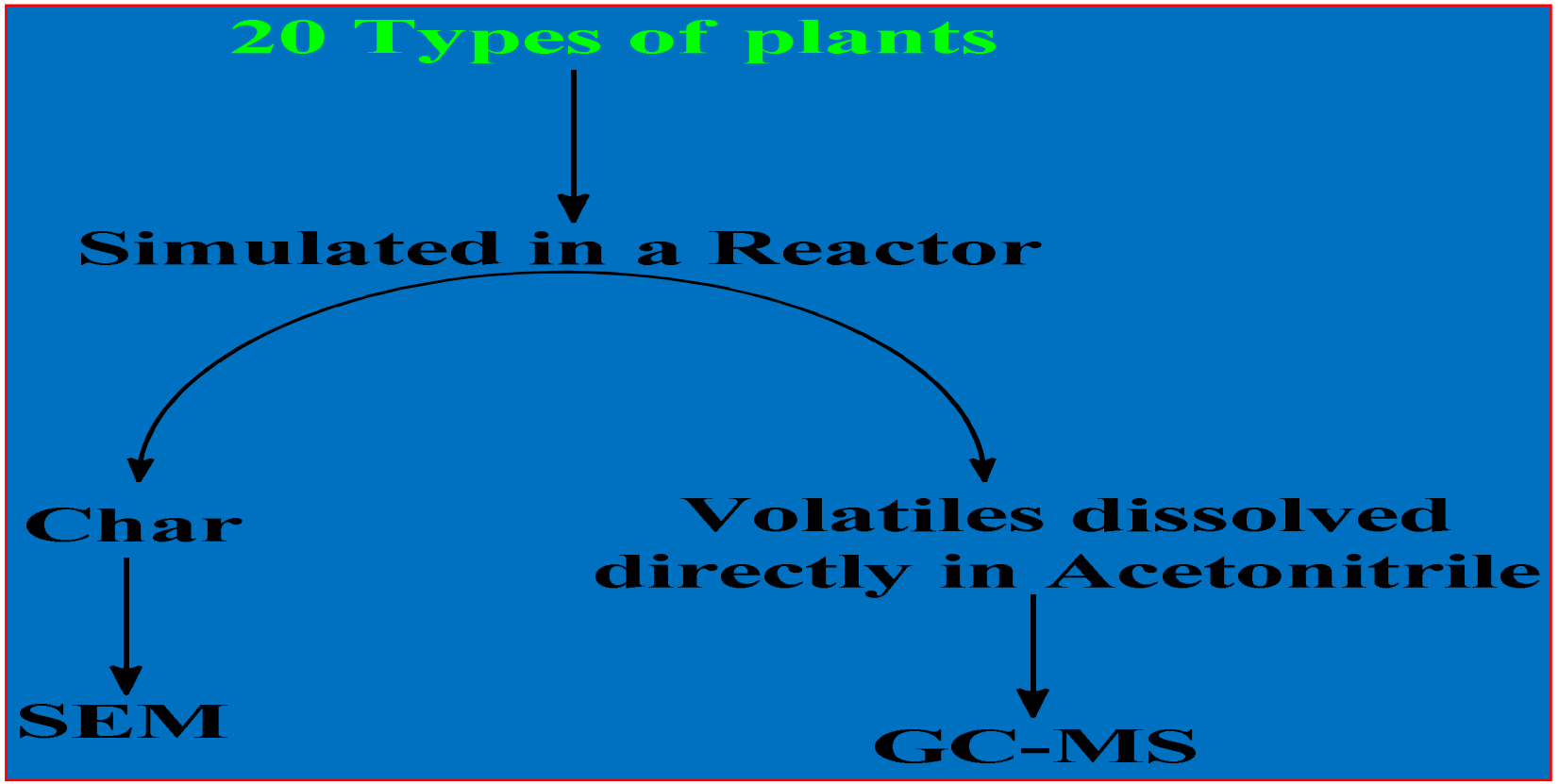
oot also tends to form in chimneys in domestic houses as well a
dustrial chimneys.

a large deposit collects in the chimney, it can ignite and genera
chimney fire.

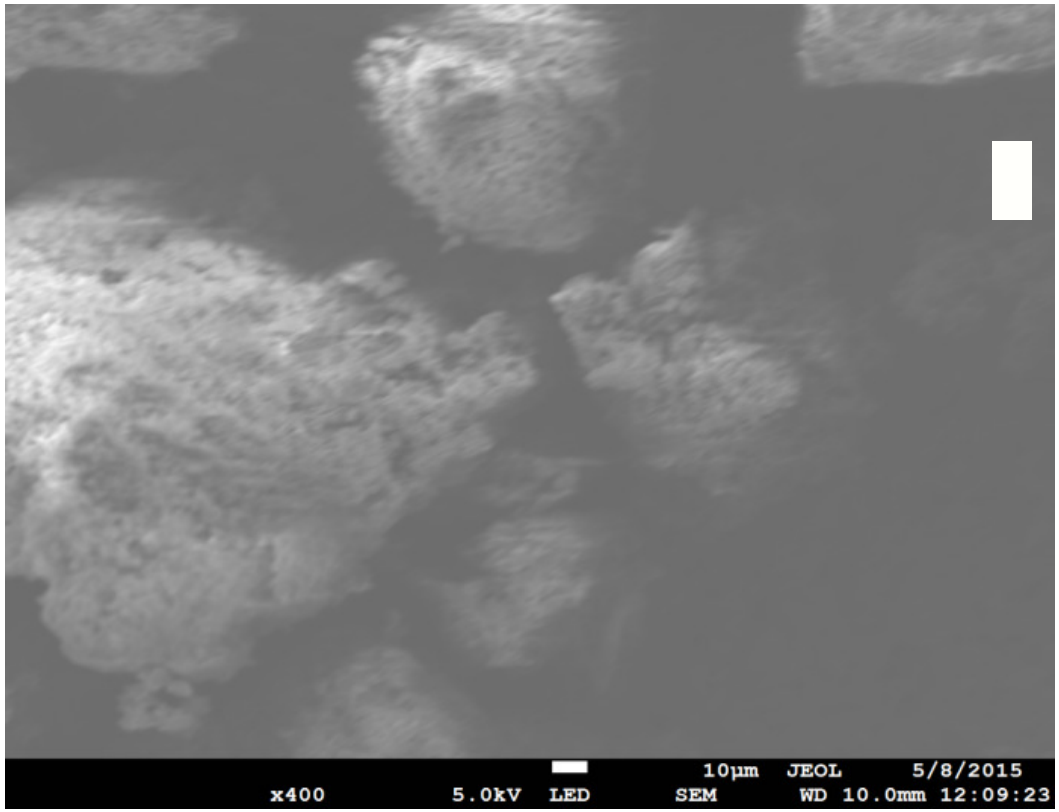
Motivation of the Study

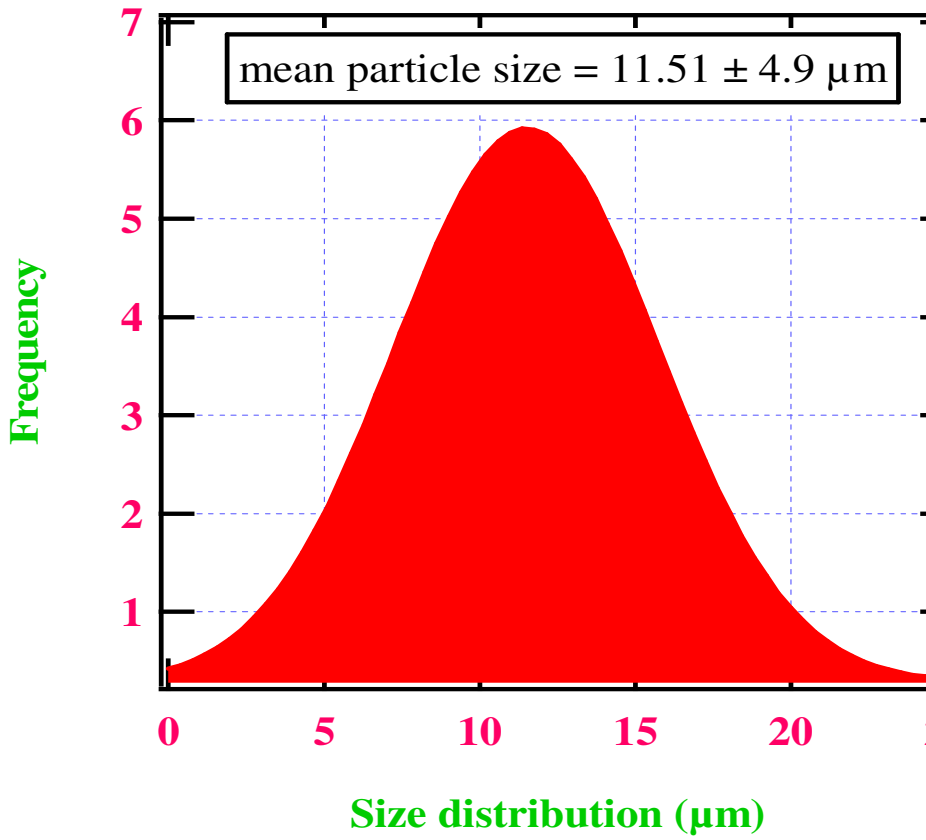
- Therefore, it is beyond doubt that humans are at risk of soot exposure.
- There is need to classify the sizes of soot particles formed fro simulated forest fire
- It is important to determine the major toxic components(volatiles) formed from simulated forest fire

Methodology

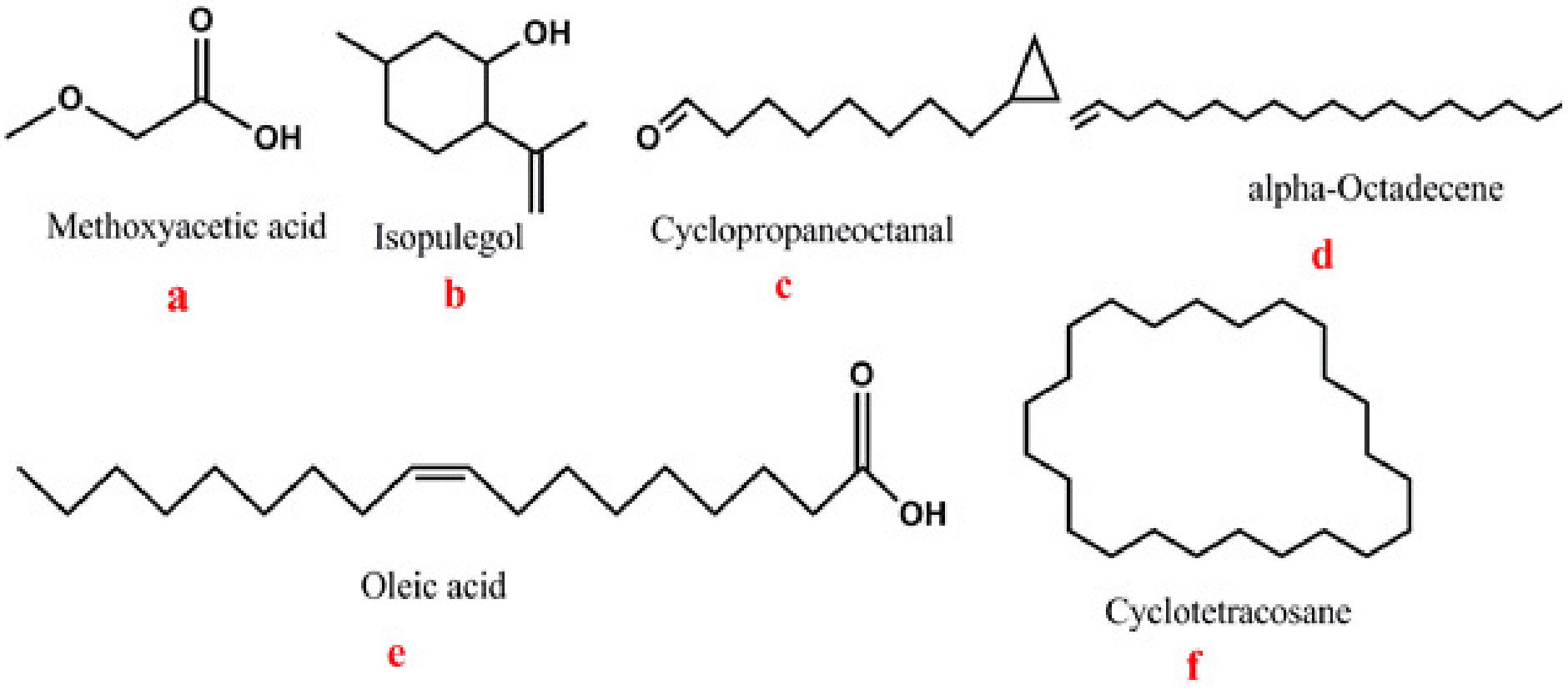


SEM Results


x400 5.0kV LED SEM 10µm JEOL WD 10.0mm 5/8/2015 12:09:23

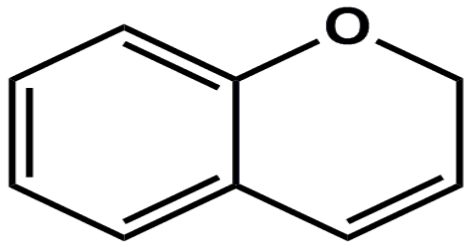

mean particle size = 11.51 ± 4.9 µm
Frequency
7
6
5
4
3
2
1
0
5
10
15
20
Size distribution (µm)

Molecular Compounds of Environmental Significance



2H-1-Benzopyran

n presence of small amounts of chlorine and a transition metal e.g. iron
opper, they can convert into the most toxic class of compounds refer
o as benzofurans usually implicated in various poisoning episodes
umans and animals

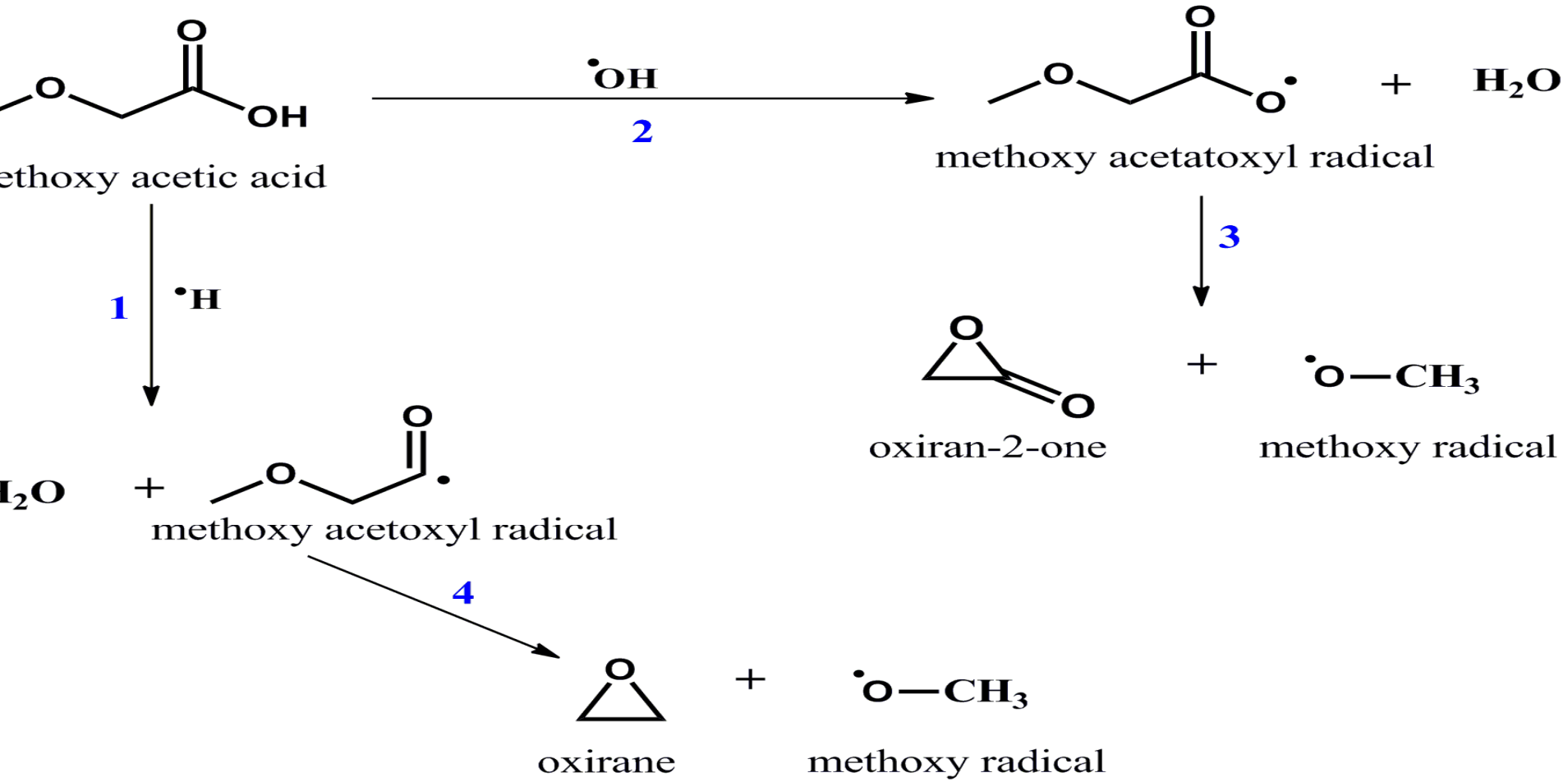


2H-1-Benzopyran

Toxic Molecular Organics

- he oxygenated molecular compounds are well known to be oxic e.g.
- ldehydes, like cyclopropaneoctanal are well known toxicants lassified as carcinogenic, and may be cytotoxic or genetoxic.
- Oxygenated components of combustion can form very reactive xygen species commonly referred to as ROS.
- roduction of ROS may result in severe oxidative stress within ells

echanistic Transformation of Methoxy Acetic Acid



Conclusions

PM from forest fire was classified as PM10

This study has remarkably shown that soot components from simulated forest fire can be related to municipal waste incineration molecular volatiles although with different intensities. For instance α-octadecene was found in high concentration in forest fire soot

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