

# 4- Bromobenzenediazonium tetrafluoroborate

Presentation for Contamination Clearance

Richa Pandey

Supervisor: Prof. V. Ramgopal Rao

Electrical Engineering, IIT Bombay

# Outline

- Introduction to 4- Bromobenzenediazonium tetrafluoroborate
- Aim of using 4- Bromobenzenediazonium tetrafluoroborate
- Chemicals to be used.
- Overview of the process and Process Flow
- **MSDS Information**
  - Physical and chemical properties
  - First Aid measures
  - Fire fighting measures
  - Handling and storage
  - Personal Protective Equipment
  - Stability and Reactivity

# Introduction

## 4- Bromobenzenediazonium tetrafluoroborate

➤ Class of organic compound sharing a common functional group  $R-N_2^+ X^-$  where R can be any organic residue such alkyl or aryl and X is an inorganic or organic anion such as a halogen.

### Aim of using 4- Bromobenzenediazonium tetrafluoroborate

- For a versatile surface chemistry capable of selective functionalization of an graphene array with controllable surface density, and which is compatible with chem/bio recognition element immobilization.
- 4- Bromobenzenediazonium tetrafluoroborate will be used in solution form and spin coated on Si/SiO<sub>2</sub> wafer using DI water as a solvent.

# Chemicals to be Used

- PMMA [**Poly(methyl methacrylate)**]
- 4- Bromobenzenediazonium tetrafluoroborate will be used in solution form using DI water as a solvent.
- Graphene deposited on Cu foil
- IPA (iso-propyl alcohol)
- Copper etchant (Ferric Chloride) solution.

# Overview of the Process

- RCA Cleaning of 2 inch Si wafer
- Growth of 0.1 micron SiO<sub>2</sub> layer
- The PMMA solution (20 mg/mL) is spin-coated on graphene/copper foils at 4000 rpm for 30 s and dried in air.
- The copper is etched with iron(III) nitrate solution (0.05 g/mL in water), and the PMMA/graphene film floats on the surface of the solution.
- After rinsing the film with distilled water, the target substrate is placed in water underneath the floating film.
- Water is pulled out to lower the film onto the substrate. After drying it under vacuum for several hours.
- Spin coat/drop cast 4- Bromobenzenediazonium tetrafluoroborate ( 0.1 M solution in DI water) on the graphene film.
- The PMMA will be removed with an acetone bath.

# Process Flow

1. Si Wafer



2. RCA Cleaning of Si Wafer



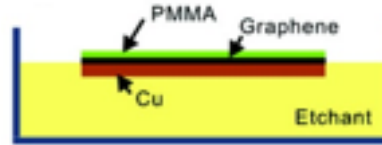
3. Growth of 0.1  $\mu$  SiO<sub>2</sub> film  
(substrate)



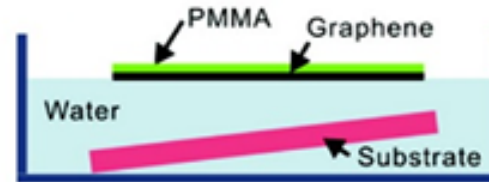
4. Spin PMMA on CVD-growth monolayer Graphene, 4000 rpm, 30s, dried in air.



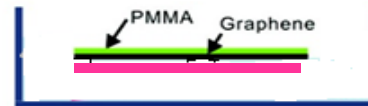
5. Copper Etching



6. Transfer on substrate

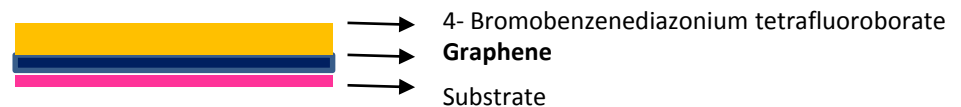


7. Dip the substrate containing the Graphene on the acetone bath to remove PMMA.



8. Spin Coat/ Drop cast

4- Bromobenzenediazonium tetrafluoroborate



# MSDS Information

## Physical and Chemical Properties

Properties	Data
Appearance	Powder
Color	Beige
Formula	C <sub>6</sub> H <sub>4</sub> BBrF <sub>4</sub> N <sub>2</sub>
Molecular weight	270,82 g/mol
Density	No data available
Melting Point	135-140 °C (dec.)(lit.)
Boiling Point	No data available
Sensitivity	Moisture sensitive

# MSDS Information

## First Aid measures

	Measures
<b>Eye Contact</b>	Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
<b>Skin Contact</b>	Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.



# MSDS Information

## First Aid measures

	Measures
<b>Inhalation</b>	If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
<b>Ingestion</b>	Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

# MSDS Information

## Handling and Storage

	Measures
<b>Precautions for safe handling</b>	Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.
<b>Conditions for safe storage</b>	Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Recommended storage temperature: 2 - 8 °C

# MSDS Information

## Personal Protective Equipment

	Measures
<b>Eye</b>	Face shield and safety glasses.
<b>Skin/Body</b>	Handle with gloves. Complete suit protecting against chemicals.
<b>Inhalation</b>	Self-contained breathing apparatus must be available in case of emergency.
<b>Ingestion</b>	Face-shield (8-inch minimum).

# MSDS Information

## Fire-fighting Measures

	Measures
<b>Suitable extinguishing media</b>	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
<b>Special protective equipment for fire-fighters</b>	Wear self contained breathing apparatus for fire fighting if necessary.
<b>Special hazards arising from the substance or mixture</b>	Carbon oxides, nitrogen oxides (NO <sub>x</sub> ), Hydrogen bromide gas, Hydrogen fluoride

# MSDS Information

## Stability and Reactivity

	Measures
<b>Chemical Stability</b>	No data available
<b>Possibility of hazardous reactions</b>	No data available
<b>Conditions to avoid</b>	No data available
<b>Materials to avoid</b>	Strong oxidizing agents, Strong bases
<b>Hazardous Decomposition Products</b>	No data available