Catalytic Polymers
Rapid Detection & Removal of Toxic Compounds

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Our Technology

Catalytic polymer that traps, detects, and decontaminates hazardous compounds like chemical warfare agents (CWA)
Chemical Warfare Agents

- Organophosphates that disrupt neurotransmitter function
- Convulsions & asphyxiation
- Vaporized or aerosolized
- Breathed in or absorbed through the skin
- Can evaporate quickly and/or leak into soil
- Safe disposal is crucial
Chemical Weapon Disposal

Hazardous Chemical Disposal Market
• Valued at over $4B
• Market growing steadily ~15% through 2019

Customers
• Federal governments
• Contractors
• Industrial chemical & agricultural firms
Chemical Weapon Disposal

Two ways to dispose of hazardous chemicals

• Incineration
  – Uses a tremendous amount of heat
  – Results in ash, water vapor, and carbon dioxide

• Neutralization
  – Uses caustic compounds
  – Results in liquid waste to be stored or processed further

Unmet Needs

• Safer reaction that results in less challenging byproducts
• Less caustic compound that is scalable, tunable, & stable
Our Technology Addresses Unmet Needs

Novel inorganic/organic hybrid

- Nontoxic
- Safe byproducts
- Stable
- Tunable
- Scalable
- Inexpensive
Unique Features that Increase Safety and Uses

- Nontoxic
- Reaction results in safe byproducts
- Stable
- Scalable & inexpensive synthesis
- Works on variety of hazardous compounds
- Tunable
- *Capture chemical warfare agents via gelation*
- *Detect agents via rapid color change*
- *Decontaminates agents via oxidation*
Capture, Detection & Decontamination

- Quickly swells & forms barrier gel on contact preventing further toxic agent penetration
Capture, Detection, & Decontamination

- Quickly swells & forms barrier gel on contact preventing further toxic agent penetration
- Color changes from red to green
Capture, Detection, & Decontamination

• Rapidly oxidizes the trapped compounds

![Diagram]

• Multiple cycles of reaction possible

POM = polymer
CWA = chemical warfare agent
## Our Technology

<table>
<thead>
<tr>
<th>Addresses Unmet Needs</th>
<th>Additional Features</th>
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</thead>
<tbody>
<tr>
<td>• Nontoxic</td>
<td>• Detects via color change</td>
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<tr>
<td>• Safe byproducts</td>
<td>• Captures</td>
</tr>
<tr>
<td>• Stable</td>
<td>• Gelates &amp; swells</td>
</tr>
<tr>
<td>• Tunable</td>
<td>• Fast (seconds)</td>
</tr>
<tr>
<td>• Scalable</td>
<td>• Decontaminates via oxidation</td>
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<tr>
<td>• Inexpensive</td>
<td>• Reusable for multiple cycles</td>
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Current & Future Development

Next Steps – Additional validation & POC studies with DoD/Army Research Office funding

IP Status – Provisional patent application filed in Dec 2015

Commercialization – Actively seeking licensee
Thank you!