Supporting Information

Thermal extremophiles: Triarylsulfonium ionic liquids stable in air for 90 days at 300 °C


a Department of Chemical & Biomolecular Engineering, University of South Alabama
b Department of Chemistry, University of South Alabama
Compound 1

Elemental Analysis

$^1$H-, $^{13}$C-, and $^{19}$F-NMR Spectra

![Chemical Structure]
<table>
<thead>
<tr>
<th>Element</th>
<th>Theory</th>
<th>Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>44.20</td>
<td>44.10</td>
</tr>
<tr>
<td>H</td>
<td>2.78</td>
<td>2.70</td>
</tr>
<tr>
<td>O</td>
<td>2.58</td>
<td>2.64</td>
</tr>
</tbody>
</table>

- **Elements:** CHNOSF
- **Present:**
  - **Analyze for:** CHN
- **Hygroscopic:** No
- **Explosive:** No
- **M.P:** unk
- **B.P:** None
- **To be dried:** Yes
- **Temp:** 100°C
- **Vac:** High
- **Time:** 4H
- **Rush Service:** Yes

Rush service guarantee analyses will be completed and results available by 5 PM EST on the day the sample is received by 11 AM.

Include Email Address or Fax # Below

jdavis@southalabama.edu

**Received:** OCT 14 2016

**Date Completed:** OCT 14 2016
Compound 2

Elemental Analysis

$^1$H-, $^{13}$C-, and $^{19}$F-NMR Spectra

[Chemical structures of TPS and BETI]
<table>
<thead>
<tr>
<th>C</th>
<th>41.06</th>
<th>41.09</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>2.35</td>
<td>2.31</td>
</tr>
<tr>
<td>N</td>
<td>2.18</td>
<td>2.24</td>
</tr>
</tbody>
</table>

Elements: CHNOSF
Present: CHN

Hygroscopic: Yes
M.P.: Unk
B.P.: None

To be dried: Yes
Temp.: 60°C
Vac.: High
Time: 4 H

Rush Service: Yes
Rush service guarantees analyses will be completed and results available by 5 PM EST on the day the sample is received by 11 AM.

Include Email Address or FAX # Below:
jdavis@southalabama.edu

Received: OCT 18 2016
Date Completed: OCT 18 2016
X : parts per Million : 1H
Compound 3

Elemental Analysis

$^1\text{H}$-, $^{13}\text{C}$-, and $^{19}\text{F}$-NMR Spectra

DPS-POP

$\text{F}_3\text{C}-\text{SO}_3\text{Na} \cdot \text{CF}_3$  
$\text{Tf}_2\text{N}$
Atlantic Microlab, Inc.

No. JD-SULFONIUM-3-RECRYSTALLIZED

Atlantic Blvd. Suite M
Mass, GA 30071
atlanticmicrolab.com

Department/Supervisor: DAVIS
CC#

Company/School: U SOUTH ALABAMA
Dept: CHEMISTRY
Address: CHEM BLDG 223
City, State, Zip: MOBILE AL 36688
Name: JAMES DAVIS
Date: 10/17/2016
Phone: (251) 751-0520

<table>
<thead>
<tr>
<th>Element</th>
<th>Theory</th>
<th>Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>49.13</td>
<td>49.27</td>
</tr>
<tr>
<td>H</td>
<td>3.01</td>
<td>2.98</td>
</tr>
<tr>
<td>N</td>
<td>2.20</td>
<td>2.21</td>
</tr>
</tbody>
</table>

Elements: CHNOSF
Present:
Analyze for:
- CHN
Hygroscopic: No
Explosive: No
M.P.: UNK
B.P.: NONE

To be dried: Yes
Temp. 60
Vac: HIGH
Time: 4H

Rush Service: Yes
Rush service guarantees analyses will be completed and results available by 5 PM EST on the day the sample is received by 11 AM.

Include Email Address or FAX # Below
jdavis@southalabama.edu

Date Received: OCT 18 2016
Date Completed: OCT 18 2016

marks:
Compound 4

Elemental Analysis

$^1$H-, $^{13}$C-, and $^{19}$F-NMR Spectra

![Chemical Structures]

DPS-POP  

BETI
### Atlantic Microlab, Inc.

**Sample No.** JD-SULFONIUM-4  
**6180 Atlantic Blvd. Suite M**  
**Norcross, GA 30071**  
[www.atlanticmicrolab.com](http://www.atlanticmicrolab.com)

**Professor/Supervisor:** DAVIS  
**PO# / CC#**

<table>
<thead>
<tr>
<th>Element</th>
<th>Theory</th>
<th>Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>45.72</td>
<td>45.66</td>
</tr>
<tr>
<td>H</td>
<td>2.60</td>
<td>2.52</td>
</tr>
<tr>
<td>N</td>
<td>1.90</td>
<td>1.94</td>
</tr>
</tbody>
</table>

- **Single [x]**  
- **Duplicate [ ]**

- **Elements CHNOSF**  
- **Present:**
- **Analyze CHN**  
- **for:**
- **Hygroscopic [ ]**  
- **Explosive [ ]**  
- **M.P. LINK [ ]**  
- **B.P. [ ]**

- **To be dried:** Yes [x]  
- **No [ ]**  
- **Temp. 100°C Vac. HIGH Time 4H [ ]**
- **Rush Service [x]**  
  Rush service guarantees analysis will be completed and results available by 5 PM EST on the day the sample is received by 11 AM.
  Include Email Address or FAX # Below  
  jdavis@southalabama.edu

**Date Received:** OCT 14 2016  
**Date Completed:** OCT 14 2016
X : parts per Million : 19F
Compound 5

Elemental Analysis

$^1$H-, $^{13}$C-, and $^{19}$F-NMR Spectra
## Atlantic Microlab, Inc.

**Sample No.** JD-SULFONIUM-5  
6180 Atlantic Blvd. Suite M  
Norcross, GA 30071  
www.atlanticmicrolab.com

**Professor/Supervisor:** JAMES DAVIS

**PO# / CC#**

---

**Company/School:** U. SOUTH ALABAMA  
**Dept.:** CHEMISTRY  
**Address:** CHEM BLDG 223  
**City, State, Zip:** MOBILE, AL, 36688  
**Name:** JAMES DAVIS  
**Date:** 10/12/2016  
**Phone:** (251) 751-0520

---

### Element Table

<table>
<thead>
<tr>
<th>Element</th>
<th>Theory</th>
<th>Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>45.68</td>
<td>45.48</td>
</tr>
<tr>
<td>H</td>
<td>2.80</td>
<td>2.82</td>
</tr>
<tr>
<td>N</td>
<td>2.05</td>
<td>2.11</td>
</tr>
</tbody>
</table>

---

**Single [X]  Duplicate [ ]**

**Elements Present:** CHNOSF

**Analyze for:** CHN

**Hygroscopic [ ]  Explosive [ ]**

**M.P. JUNK [ ]  B.P. NONE [ ]**

**To be dried: Yes [X]  No [ ]**

**Temp. 100°C [ ]  Vac. HIGH [ ]  Time 4H [ ]**

**Rush Service [X]** Rush service guarantees analyses will be completed and results available by 5 PM EST on the day the sample is received by 11 AM.

**Include Email Address or FAX # Below**

jdavis@southalabama.edu

---

**Date Received:** OCT 14 2016  
**Date Completed:** OCT 14 2016

**Remarks:**
Compound 6

Elemental Analysis

$^1\text{H}$-, $^{13}\text{C}$-, and $^{19}\text{F}$-NMR Spectra
### Atlantic Microlab, Inc.

Sample No. JD-SULFONIUM-6

6180 Atlantic Blvd. Suite M
Norcross, GA 30071
www.atlanticmicrolab.com

Company/School: U SOUTH ALABAMA
Dept. CHEMISTRY
Address: CHEM BLDG 223
City, State, Zip: MOBILE, AL, 36688

PO# / CC#: ________________

Professor/Supervisor: DAVIS

Name: JAMES DAVIS
Phone: (251) 751-0520

Date: 10/12/2016

<table>
<thead>
<tr>
<th>Element</th>
<th>Theory</th>
<th>Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>42.91</td>
<td>42.95</td>
</tr>
<tr>
<td>H</td>
<td>2.44</td>
<td>2.44</td>
</tr>
<tr>
<td>N</td>
<td>1.79</td>
<td>1.85</td>
</tr>
</tbody>
</table>

Single [X] Duplicate [ ]

Elements CHNOSF Present:

- Analyze CHN for:
  - Hygroscopic [ ] Explosive [ ]
  - M.P. UNK B.P. NONE

- To be dried: Yes [X] No [ ]
  - Temp. 100C Vac. HIGH Time 4H

Rush Service [X]
Rush service guarantees analyses will be completed and results available by 5 PM EST on the day the sample is received by 11 AM.

Include Email Address or FAX # Below
jdhospital@southalabama.edu

Date Received: OCT 14 2016
Date Completed: OCT 14 2016

Remarks:
Compiled NMR Data

Compound 1 (TPS Tf₂N):

\(^1\)H (CDCl₃, 500 MHz): \(\delta\) 7.35-7.79 (m, 3H), 7.66-7.72 (m, 6H), and 7.60-7.65 (m, 6H) ppm.

\(^{13}\)C (CDCl₃, 125 MHz): \(\delta\) 134.86, 131.76, 130.90, 123.98, 123.69, 121.14, 118.58 and 116.02 ppm.

\(^{19}\)F (CDCl₃, 470 MHz): \(\delta\) -78.62 ppm.

Compound 2 (TPS BETI):

\(^1\)H (CDCl₃, 500 MHz): \(\delta\) 7.74-7.78 (m, 3H), 7.66-7.72 (m, 6H), and 7.60-7.64 (m, 6H) ppm.

\(^{13}\)C (CDCl₃, 125 MHz): \(\delta\) 134.97, 131.75, 130.88, 123.89, 119.46, 119.20, 118.93, 117.17, 116.91, 116.64, 114.19, 113.88, 111.85, 111.55, 109.51, and 109.21 ppm.

\(^{19}\)F (CDCl₃, 470 MHz): \(\delta\) -78.77 and -116.98 ppm.

Compound 3 (DPS-POP Tf₂N):

\(^1\)H (CDCl₃, 500 MHz): \(\delta\) 7.73-7.79 (m, 2H), 7.67-7.73 (m, 4H), 7.60-7.65 (m, 6H), 7.40-7.44 (tt, 2H), 7.23-7.28 (m, 1H), 7.16-7.21 (m, 2H), and 7.07-7.11 (m, 2H) ppm.

\(^{13}\)C (CDCl₃, 125 MHz): \(\delta\) 163.68, 153.75, 134.56, 133.36, 131.61, 130.45, 130.36, 125.80, 124.53, 123.63, 121.08, 120.62, 119.59, 118.52, 115.96, and 114.67 ppm.

\(^{19}\)F (CDCl₃, 470 MHz): \(\delta\) -78.59 ppm.

Compound 4 (DPS-POP BETI):

\(^1\)H (CDCl₃, 500 MHz): \(\delta\) 7.73-7.79 (m, 2H), 7.67-7.73 (m, 4H), 7.60-7.66 (m, 6H), 7.40-7.45 (tt, 2H), 7.23-7.28 (m, 1H), 7.16-7.20 (m, 2H), and 7.07-7.11 (m, 2H) ppm.

\(^{13}\)C (CDCl₃, 125 MHz): \(\delta\) 163.74, 153.78, 134.57, 133.38, 131.62, 130.45, 130.37, 125.82, 124.57, 120.64, 121.70, 121.45, 121.20, 119.79, 119.59, 119.43, 119.16, 118.89, 117.13, 116.87, 116.60, 114.80, 114.69, 114.40, 114.13, 113.83, 112.10, 111.80, 111.49, 111.18, 109.80, 109.46, and 109.45 ppm.

\(^{19}\)F (CDCl₃, 470 MHz): \(\delta\) -78.73 and -116.96 ppm.
**Compound 5 (DPS-PSP Tf$_2$N):**

$^1$H (CDCl$_3$, 500 MHz): $\delta$ 8.14-8.18 (dd, 2H), 7.88-7.92 (dd, 2H), 7.74-7.80 (m, 4H), 7.64-7.72 (m, 8H), 7.58-7.63 (m, 1H), and 7.50-7.55 (m, 2H) ppm.

$^{13}$C (CDCl$_3$, 125 MHz): $\delta$ 147.51, 139.21, 135.37, 134.42, 132.02, 131.75, 131.35, 130.25, 129.89, 129.80, 128.14, 123.20, 122.84, 121.03, 118.47, and 115.92 ppm.

$^{19}$F (CDCl$_3$, 470 MHz): $\delta$ -78.64 ppm.

**Compound 6 (DPS-PSP BETI):**

$^1$H (CDCl$_3$, 500 MHz): $\delta$ 8.14-8.19 (dd, 2H), 7.88-7.92 (dd, 2H), 7.74-7.82 (m, 4H), 7.64-7.72 (m, 8H), 7.58-7.63 (m, 1H), and 7.49-7.54 (m, 2H) ppm.

$^{13}$C (CDCl$_3$, 125 MHz): $\delta$ 147.40, 139.20, 135.20, 134.36, 131.94, 131.79, 131.22, 130.19, 129.86, 129.74, 128.03, 122.70, 121.60, 121.33, 121.07, 119.31, 119.05, 118.78, 117.02, 116.75, 116.49, 114.47, 114.20, 113.77, 112.04, 11.74, 111.42, 111.12, 109.39, and 109.09 ppm.

$^{19}$F (CDCl$_3$, 470 MHz): $\delta$ -78.74 and -117.01 ppm.