3 Results and Discussion

Table 1 summarizes the mean diameters of Au particles (D\text{Au}) of Au supported on TiO\textsubscript{2}, SiO\textsubscript{2}, SiO\textsubscript{2}-Al\textsubscript{2}O\textsubscript{3}, and AC and their 50% conversion temperature in CO oxidation reaction (T\text{1/2}). The result shows that the mean diameter of Au particles deposited on these supports by GG are under 7 nm. Therefore, it is found that a support is not limited to select metal oxides to support Au catalysts by GG method, while the standard deviations of D\text{Au} for Au catalysts prepared by GG are larger than those of Au catalysts prepared by DP. The mean diameter of Au/SiO\textsubscript{2} prepared by GG is 3 times smaller than that of Au/SiO\textsubscript{2} prepared by IMP method. Though Au/SiO\textsubscript{2} prepared by IMP was less active for CO oxidation than Au/TiO\textsubscript{2}, the catalytic activity of Au/SiO\textsubscript{2} prepared by GG is improved with a decrease of D\text{Au}.

In the cases of Au/SiO\textsubscript{2}-Al\textsubscript{2}O\textsubscript{3} and Au/AC, although D\text{Au} of these catalysts are similar to that of Au/SiO\textsubscript{2} by GG, the catalytic activities of Au/SiO\textsubscript{2}-Al\textsubscript{2}O\textsubscript{3} and Au/AC are less active than others (T\text{1/2}[CO] and TOF). This fact shows that an acidic support like SiO\textsubscript{2}-Al\textsubscript{2}O\textsubscript{3} and non metal oxide support like AC are not suitable for CO oxidation reaction. Consequently, it is found that the size of Au particles on the support and the selection of supports are major controlling factors for the evolution of CO oxidation catalytic activity.

<table>
<thead>
<tr>
<th>Support</th>
<th>Method</th>
<th>Au loading / wt%</th>
<th>Calc. temp. / K</th>
<th>D\text{Au} / nm</th>
<th>T\text{1/2}[CO] / K</th>
<th>TOF[273K] / s\textsuperscript{-1}</th>
</tr>
</thead>
<tbody>
<tr>
<td>TiO\textsubscript{2}</td>
<td>GG</td>
<td>4.7</td>
<td>573</td>
<td>3.8±2.7</td>
<td>239</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>DP</td>
<td>2.0</td>
<td>573</td>
<td>1.7±0.4</td>
<td>237</td>
<td>0.06</td>
</tr>
<tr>
<td>SiO\textsubscript{2}</td>
<td>GG</td>
<td>6.6</td>
<td>673</td>
<td>6.6±3.8</td>
<td>227</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>IMP</td>
<td>14.7</td>
<td>673</td>
<td>20</td>
<td>668</td>
<td>-</td>
</tr>
<tr>
<td>SiO\textsubscript{2}-Al\textsubscript{2}O\textsubscript{3}</td>
<td>GG</td>
<td>3.0</td>
<td>673</td>
<td>6.9±1.7</td>
<td>481</td>
<td>-</td>
</tr>
<tr>
<td>AC</td>
<td>GG</td>
<td>5.2</td>
<td>573</td>
<td>5.0±1.6</td>
<td>573&lt;</td>
<td>-</td>
</tr>
</tbody>
</table>

References

the carrier of these spectra must be C_{10}, although some peculiarities in the spectra remain to be understood completely. Here we announce the unequivocal detection of the rotationally resolved gas phase spectrum of the linear carbon cluster C_{10}. More than 100 rotational-vibrational transitions have been assigned to three partially overlapping bands arising from the 3\Sigma_g^+ ground electronic state of the antisymmetric \nu_6 stretching mode. The three bands display \textit{P} and \textit{R} branches in accordance with the expected parallel type character. The band origin centered at 2074.43 cm^{-1} is in excellent agreement with the value 2074.5 cm^{-1} reported from matrix isolation measurements of C_{10} (Freivogel \textit{et al.} 1997). The ground state rotational constant, \(B'' = 0.0104974(51)\) cm^{-1}, is close to the theoretically ab initio predicted value of 0.01048 cm^{-1}. The large and negative value of the electronic spin-spin coupling constant \(\lambda'' = -1.856(53)\) cm^{-1} causes the three sets of energy levels to separate into two sets of nearly equally high energy and one set of much higher energy, \textit{i.e.} of about 4 cm^{-1}. Accordingly, the intensity of the third band is weaker than that of the two other bands, which display about equal intensity. Further details and the full account of the C_{10} spectra will be given elsewhere in a forthcoming paper.

References


HIGH RESOLUTION INFRARED SPECTROSCOPY OF IONIC COMPLEXES

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Direct absorption spectroscopy of tunable infrared diode laser radiation through an adiabatically cooled planar plasma is shown to be an efficient way to study ionic complexes at high resolution. In this contribution an overview will be given on the experimental method and recent results.

1 Introduction

Within the last years new experimental and theoretical techniques have been developed which permit the investigation of weak intermolecular forces at an unprecedented level of detail. However, whereas neutral complexes have been studied extensively in the past, high resolution data of poly-atomic ionic complexes are only available for a few systems. The importance of this type of molecules in chemistry is indisputable; ionic complexes are known to play a key role as intermediates in many processes and, especially, in atmospheric chemistry they are expected to be of elementary relevance. Consequently, many efforts have been put in the development of a source that produces ionic complexes in abundances large enough to be spectroscopically detectable. The present technique offers such a possibility and is based on the combination of a supersonic planar expansion with subsequent electron impact ionization.

2 Experimental

Details of the experimental setup are available from Ref. 1. A supersonic plasma is generated by electron impact ionization of gas that is expanded through a 32 mm x 50 \mu m long slit into a vacuum chamber. The electrons are emitted by a heated tungsten wire that is mounted parallel to and slightly below the slit. The filament is positioned in a slotted tube made of Mo that is put on the same negative potential as the filament. A slotted stainless steel shield kept at earth potential is mounted just above the tube in order to accelerate the electrons towards the jet. This configuration allows a fast production modulation by changing the electron gun field gradients. The