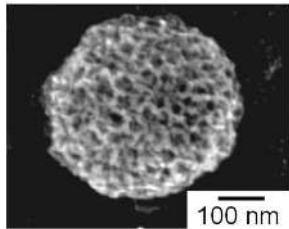
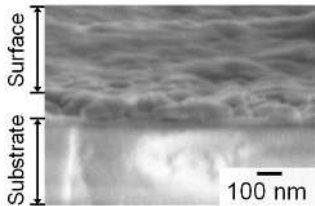
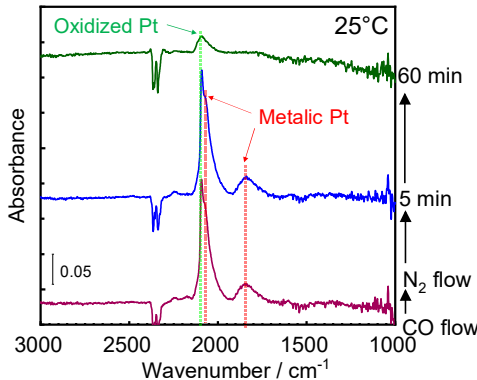
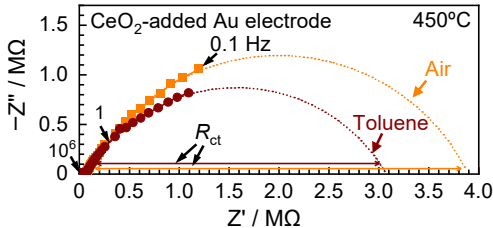


| Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Job Title           | Area of Expertise             |
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| UEDA Taro                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Associate Professor | Electrochemistry, Gas Sensors |
| <b>1. Main Research Topics</b><br><b>(1) Development of Highly Sensitive Gas-Sensing Materials</b><br><p>Sensing materials for high-performance gas sensors have been developed. We have developed semiconductor-type sensors and electrochemical-type sensors capable of detecting combustible gases and carbon monoxide (CO). Detection of trace levels of volatile organic compounds (VOCs) emitted from human breath and skin is a primary objective.</p> <p><b>Example 1: Porous Tin Oxide (pr-SnO<sub>2</sub>) Particle</b><br/> Porous SnO<sub>2</sub> particles were synthesized by ultrasonic spray pyrolysis using a precursor solution containing tin ions and polymeric microspheres as a template (diameter: 70 nm), followed by thermal decomposition and crystallization (Fig. 1). The co-addition of noble metals and metal oxides significantly enhanced the sensor response to acetone.<br/> <a href="https://doi.org/10.3390/chemosensors12080153">https://doi.org/10.3390/chemosensors12080153</a> (Open Access)</p> <p><b>Example 2: Au-Based Thin Film Electrodes</b><br/> Thin film electrodes were fabricated by spin-coating method using a solution containing gold and cerium ions onto a solid electrolyte substrate, followed by high-speed rotation and thermal treatment. The fabricated sensor exhibited highly sensitive detection of toluene (Fig. 2).<br/> <a href="https://doi.org/10.1016/j.snb.2024.136217">https://doi.org/10.1016/j.snb.2024.136217</a> (Open Access)</p> <b>(2) Elucidation of Sensing Mechanisms</b><br><p>Understanding sensing mechanisms is essential for the development of high-performance gas sensors. Gas adsorption behavior and surface reaction activity of sensing materials have been investigated using diffuse reflectance infrared Fourier transform spectroscopy (DRIFT) and electrochemical measurement techniques, respectively.</p> <p><b>Example 3: Analysis of CO Oxidation Behavior</b><br/> Efficient CO oxidation was promoted by highly dispersed metallic Pt, as evidenced by the disappearance of CO adsorbed on metallic Pt over time, in contrast to the persistent adsorption observed on oxidized Pt (Fig. 3).<br/> <a href="https://doi.org/10.1007/s10853-023-08655-5">https://doi.org/10.1007/s10853-023-08655-5</a></p> <p><b>Example 4: Analysis of Toluene Oxidation Behavior</b><br/> Electrochemical impedance measurements were conducted, and the electrochemical activity at the interface was evaluated from the resulting Nyquist plots. A smaller diameter of the semicircle reflects a higher electrode reaction activity. The significant decrease in diameter upon exposure to toluene indicates electrochemical oxidation of toluene at the interface (Fig. 4).<br/> <a href="https://doi.org/10.1016/j.snb.2024.136217">https://doi.org/10.1016/j.snb.2024.136217</a> (Open Access)</p> |                     |                               |
|  <p>Fig. 1. pr-SnO<sub>2</sub> particle.</p>  <p>Fig. 2. Au-based thin film electrode*.</p>  <p>Fig. 3. DRIFT analysis of CO oxidation.</p>  <p>Fig. 4. Electrochemical analysis of toluene oxidation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                               |
| <b>2. Keywords</b><br>Gas sensors, Functional ceramics, Solid electrolyte, Volatile organic compounds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                               |
| <b>3. Remarks and Websites</b><br><p>The development of gas sensors capable of analyzing exhaled breath and skin-emitted gases opens up new possibilities for early detection of diseases such as diabetes and cancer. It also enables efficient screening of patients with infectious diseases, such as malaria, in tropical regions. This technology is expected to greatly contribute to solving medical and health problems in the world.</p> <p><b>researchmap:</b> <a href="https://researchmap.jp/taroueda">https://researchmap.jp/taroueda</a><br/> <b>Laboratory:</b> <a href="http://www.cms.nagasaki-u.ac.jp/lab/zaika/zak.htm">http://www.cms.nagasaki-u.ac.jp/lab/zaika/zak.htm</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                               |