

Name	Job Title	Area of Expertise
URITA Koki	Associate Professor	Surface Chemistry, Nanomaterial Science
1. Main Research Topics ① Research on Rare Resource Recovery Using Electrochemical Methods To build a sustainable society, securing energy resources and achieving carbon neutrality are global challenges. Many countries are beginning to shift toward environmentally conscious policies, making the stable supply of rare resources increasingly important. In this context, we have initiated research on the recovery of rare resources (such as Li) from waste Li-ion batteries (LIBs) and production scraps using electrochemical methods. These methods are derived from capacitive deionization (CDI) technology, which has long been used in seawater desalination processes. Our current goal is to achieve a Li-ion separation efficiency of 90%. ② Material Design for Air Separation and CO₂ Capture Improving energy efficiency in combustion furnaces can be achieved through the use of oxygen-enriched air. Carbon molecular sieves (CMS) are materials capable of separating oxygen and nitrogen from air. However, if the barrier layer at the pore entrance of CMS is excessively thick, the permeation rate of oxygen molecules decreases, leading to reduced air separation performance. To address this, we are exploring air separation by forming ultra-thin barrier layers through electrochemical oxidation of activated carbon, which introduces oxygen-containing functional groups near the pore entrances. Achievement: Enhanced O ₂ selectivity of carbon molecular sieves by electrochemical oxidation for air separation, Carbon, 235, 120088 (2025) [Open Access]. ③ Local Structural Analysis of Materials for Energy Storage Devices Porous carbon materials, due to their electrical conductivity, nanoscale porosity, and high specific surface area, are widely used as electrode materials in rechargeable batteries and electric double-layer capacitors (EDLCs). In systems involving chemical reactions between electrolyte ions and electrodes—such as LIBs—active materials like SnO ₂ and sulfur, which promise high capacity, undergo significant volume changes upon reaction with Li ions. By controlling the reaction space within the nanoscale pores of carbon electrodes, cycle stability can be improved. To answer the question, “What types of nanopores are effective for reactions between active materials and electrolyte ions?”, we observe electrode materials (e.g., sulfur-loaded carbon nanotubes, S@CNT) during discharge using transmission electron microscopy (TEM), identifying pore sizes that facilitate charge-discharge reactions. Additionally, for EDLCs, we have identified optimal pore sizes and shapes by quantitatively evaluating pore structures via gas adsorption methods and characterizing pore morphology using TEM.		
2. Keywords Porous carbon, Air separation, Resource recovery, Electron microscopy, Adsorption		
3. Remarks and Websites - K. Urita , C. Urita, H. Tanaka, F. Vallejos-Burgos, H. Notohara, T. Araki, K. Horio, H. Furukawa, M. Yoshida, I. Moriguchi, "Tuning carbon black surface morphology via controlled thermal treatment atmosphere" App. Surf. Sci., 710(30), 163907 (2025). - S. Wang, F. Vallejos-Burgos, A. Furuse, H. Otsuka, M. Nagae, Y. Kawamata, T. Ohba, H. Kanoh, K. Urita , H. Notohara, I. Moriguchi, H. Tanaka, J. P. Marco-Lozar, J. Silvestre-Albero, T. Hayashi, K. Kaneko, "Ambient pressure storage of high-density methane in nanoporous carbon coated with graphene" Nat. Energy, 10, 847-856 (2025). - K. Urita , T. Ishida, K. Marubayashi, H. Tanaka, M. Hamasaki, Y. Yamane, J. Miyawaki, H. Notohara, I. Moriguchi, "Enhanced O ₂ selectivity of carbon molecular sieves by electrochemical oxidation for air separation" Carbon, 235, 120088 (2025). researchmap: https://researchmap.jp/read0150871 Laboratory: https://www.cms.nagasaki-u.ac.jp/lab/bukka/A/top_e.html		