【別紙２】

論文名：Development of novel dolomite-based adsorbents with phosphorus and adsorption characteristics of As(III) and Cr(VI)（要約）

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Heavy metals from industrial processes and urbanization are significant concerning issues due to emissions over allowed limits causing serious health and environmental hazards, and the treatment of water remains a major challenge. Especially, pollution of heavy metals of As(III) and Cr(VI) in the aquatic medium is a wide public concern due to its serious impact on the environment and health, unfortunately, polluted areas of heavy metals have increased around the world.

On the other hand, the development of adsorbents with high efficiency, low cost, and environment friendly for removal of heavy metals is highly crucial. The purpose of this study is to develop the dolomite-based adsorbents with phosphorus and Fe(III) and used them for the removal of As (III) and Cr(VI), and also to reveal the adsorption mechanism between adsorbent and adsorbate.

Developed adsorbents were synthesized by calcined dolomites with addition rate of phosphorus and Fe(III). Also, the influence of calcination temperature and addition rate of phosphorus and iron on the porosity of the novel dolomite-based adsorbents were considered. Characteristics of the new adsorbents were evaluated by N2-BET, XRD, SEM-EDS, and FTIR. Furthermore, novel adsorbents were used for the adsorption of As(III) and Cr(VI).

Our results confirmed the developed adsorbent with phosphorus is composed of magnesium oxide (MgO) and hydroxyapatite (Ca5(PO4)3OH or Hap), which has high ion-exchange properties and displays efficient adsorption of As(III). However, further studies should investigate arsenic adsorption experiments in groundwater and wastewater and reveal the mechanism of arsenic removal.

On the other hand, we also developed another novel adsorbent modified by Fe(III) to remove of oxyanions. Our results revealed the appropriate addition rate of phosphorus and Fe(III) ratio onto calcined dolomite (1.5% P/ 3.5% Fe(III), and the optimal re-calcination temperature was at 4500C. This modified adsorbent has high surface area (49.3418m2/g) and high affinity for Cr(VI). Adsorption characteristics of Cr(VI) onto modified by Fe(III) novel adsorbent were investigated. The modified adsorbent showed Cr(VI) adsorption capacity of 4.49 mg/g and 92.19% for 10ppm initial concentration of Cr(VI). The experimental data could be well-fitted by pseudo-first-order kinetic and Freundlich isotherm models. The thermodynamic studies

determined that the adsorption process decreased with increasing temperature, and was exothermic in nature. Based on the results, we assume physical sorption and electrostatic interaction are dominant because the fine mesoporous of Fe2O3 leads to increasing the adsorption process due to its low crystallinity and gradual increase in surface area.

In summary, newly developed adsorbents can act as effective adsorbents for As(III) and Cr(VI). It can be used to clean up contaminated industrial effluent and is key data for sustainable management.