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Removal of arsenic contaminants with natural and synthesized magnetic minerals

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In the study we investigated the comparison of Arsenic (As) removal from the aqueous solution using the natural and synthesized magnetic particles. The natural magnetic rocks were collected at Yangmingshan National Park in Taiwan. The mineral components consisted of siderite, hematite or magnetite based on the XRD data. Other magnetic particles were synthesized by the co-precipitation method using microbial precipitation by *Bacillus pasteurii* and humic acid (HA) without N₂ injection. The XRD data revealed that synthesized products are α -Fe₂O₃, α -Fe₂O₃/*BP*, γ -Fe₂O₃ and γ -Fe₂O₃/HA. The crystal morphology and size distribution of the magnetic particles were analyzed by SEM and TEM. The magnetic force was analyzed by SQUID VSM. The specific surface area was measured by BET. The adsorption capacity of the synthetic materials were performed and compared with the natural magnetic minerals. The effects of different HA concentration for As removal efficiency were also studied. The batch adsorptions of were performed using 2 ppm As with different adsorbent doses of 10mg, 30mg, 50mg, 70mg, 100mg at 25°C. The adsorption isotherms were calculated. The adsorption capacity was related to the magnetic force and the specific surface area. In conclusion, the synthetic materials and natural materials were capable of As removal and were able to be recycled for sustainable use.