**Enhanced Adsorption of Cr(VI) on BiOBr under** **Alkaline Conditions: Interlayer** **Anion Exchange**

Lixia Jia b, Wei Zhou c, Xiang Huang d, Yizhong Zhang b, Qiangying Zhang d, Xin Tan b, d, Tao Yu \*, a, e

a School of Chemical Engineering and Technology, Tianjin University, Tianjin, 300350, P. R. China

b School of Environmental Science and Engineering, Tianjin University, Tianjin, 300350, P. R. China

c School of Science, Tianjin University, Tianjin, 300350, P. R. China

d School of Science, Tibet University, Lhasa, 850000, P. R. China

e Collaborative Innovation Center of Chemical Science and Engineering (Tianjin), Tianjin, 300072, P. R. China

Corresponding author: Yu Tao, yutao@tju.edu.cn

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**ABSTRACT**

It remains a formidable challenge to remove toxic oxoanions in alkaline conditions. Here, we reveal an enhanced adsorption of Cr(VI) on 3D spherical BiOBr in alkaline conditions. Higher pH values benefit Cr(VI) adsorption on BiOBr, which is a completely different behavior from conventional metal-oxide adsorbents. A unique adsorption mechanism of Cr(VI) on BiOBr is proposed for the first time and demonstrated by experimental results and characterization. X-ray photoelectron spectroscopy and Fourier-transform infrared spectroscopy of BiOBr before and after adsorption indicates a Br−–Cr(VI) anion exchange. Variations of Br− concentrations and pH values of the solutions further verify the interlayer anion exchange between Br− and Cr(VI) ion and the role of OH− in the adsorption process. The presence of OH− promotes the release of Br−, generating cavities for the CrO42− species, thereby significantly improving the adsorption of Cr(VI). More importantly, the anion exchange is theoretically feasible, which is confirmed by density functional theory calculations through comparison of the adsorption energies. Although the stability and reproducibility of the adsorbent await to perfect further, the study provides a new perspective on the adsorption of toxic oxoanions in alkaline conditions and uncovers an original adsorption mechanism of BiOXs (X = Cl, Br, I).