La3+ and mixed-rare earth magnetic chitosan beads (MCLB and MCLRB) were successfully prepared for fluoride removal, respectively. The adsorbents were characterized by scanning electron microscope and magnetic response. Batch experiments were carried out to investigate the adsorbent performance based on the influence of various factors such as adsorbent dosage, contact time, initial solution pH and co-existing anions on the fluoride adsorption. Results showed that MCLB and MCLRB followed the pseudo-second-order kinetic model with the correlation coefficient value of 0.9925 and 0.9985 respectively. The adsorption process was mainly chemical adsorption. The isotherm data was well fitted both Langmuir model and Freundlich model. The adsorption capacity of the adsorbents were 20.53 and 22.35mg/g respectively. The optimum pH value for fluoride ion removal was 5.0. The effects of co-existing anions on the fluoride sorption followed the decreasing order of CO32->HCO3->SO42->NO3->Cl-. Fluoride adsorption on MCLB and MCLRB could be attributed to ion exchange between fluoride and OH groups with the FeO coordinate bond promotion. Our study revealed that MCLB and MCLRB performed strong adsorption capacity for fluoride ion. In particularly, MCLRB could be a more cost-effective adsorbent to remove fluoride from aqueous solution.