Oxytetracycline sorption from synthetic effluent with metal organic frameworks

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The monitoring of farmacologic residues has been gaining ground within the production impact of these emerging contaminants. In fact, many drugs and / or derivatives are found in the aquatic environment. In recent decades, researchers have been exploring treatment in various matrices using organometallic polymeric matrices as adsorbents. These networks of coordination, called Metal Organic Frameworks (MOF's), are formed by metals and organic ligands. The work herein presented aimed the development of a process to remove the drug oxytetracycline (OTC), in fixed bed column using different types of MOF Basolite both "in nature" and activated. Kinetic studies were evaluated to identify the behavior of the saturation of the column. The percentage removed ranged from 4.25 to 99.73% in 1 hour of experiment. The removal of OTC using Basolite A100 occurred rapidly, reaching high levels of retention in the starting minutes, in ± 30 minutes the balance of the process was reached, either for the MOF in nature, as well for the activated. The saturation of the column using Basolite C300 behaved sharply for the two types of adsorbent, indicating the complete exhaustion of the column (C/C_0=1). The rupture curve of the Basolite Z1200 occurred more smoothly, especially for MOF "in nature". Where, the better interaction of the drug, indicating a high retention capacity of the bed for a period exceeding 60 minutes of treatment. Characterizations by IR and BET of the studied MOFs were performed in order to investigate the rapid saturation of MOFs A100 and C300, as well as the malfunctioning of MOFs activated before the adsorption of the drug. Considering that the MOF Z1200 showed better retention of oxytetracycline, a factorial design in a continuous system was applyed in order to evaluate the variables that exhibit significant effects on the response. We studied two variables at two levels, plus a central point in duplicate. The variables were weight and time. The tests were conducted, with the objective of obtaining an estimate of pure experimental error, putting in contact the MOF type Basolite Z1200 with the solution of oxytetracycline at 10 $mg.L^{-1}$ under the conditions defined by the experimental planning. The response studied was the removal (%) of the oxytetracycline. The best result was 99.33%, obtained when the factors evaluated were on their upper and lower level from mass and time variables respectively. The estimated pure error was 3.07% for any one of the effects. The main effects and their interactions were calculated at a 95% level of confidence.
Keywords: drug, metal organic frameworks, sorption.

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