Jiangyan Yuan, J Material Sci Eng 2017, 6:4(Suppl)
DOI: 10.4172/2169-0022-C1-068

Preparation of zeolite for slow-release fertilizer using K-feldspar powder

Jiangyan Yuan
China University of Geosciences, China

The 30-50% of crop yields is attributed to the commercial chemical fertilizers according to conservative estimation. Abuse of chemical fertilizers causes serious contamination and environmental hazards, and very low amount of nutrition is absorbed by the plants. The utilization of slow release fertilizer can slow down the migration rate of nutritional elements, which is beneficial to the improvement of fertilizer use efficiency and production, as well as the decrease of soil contamination. The global demand of potash has exceeded 32 million metric tons of K_2O in current time and will have a continuous increase in the coming decade potassium-bearing framework aluminosilicate minerals have been proposed as a substitute source of potassium. As a kind of K-zeolite, zeolite F still provide K element necessary to the growth of plants and amend soil besides the function of retaining water and nutrition. Synthesis of F zeolites from K-feldspar is one of the promising applications of K elements in soil. The X-ray diffraction (XRD) patterns of zeolite F($KALSiO_4.1.5\ H_2O$) obtained by the hydrothermal method after the fusing of K-feldspar. All of the diffraction peaks can be basically indexed to the tetragonal phases of zeolite F (JCPDS file 38-0216) as shown in Figure 1a. The strongest peak of zeolite F at 30.17° is assigned to its (114) crystal plane. We can see the morphology of zeolite F from Figure 1b that presents tetragonal cross-shaped composed of rectangular sheet. According to the test of water solubility, accumulative release of K_2O can be fitted by the equation as follows: $y=0.6349-0.0157\ln(x-0.994)$, where y is accumulative release of K_2O (%) and x is test time (days); and the correlation coefficient $R^2=0.991$. which indicates the release of zeolite F belongs to Elovich equation. By the observation and prediction of Figure 1a, the accumulative release of K_2O reaches 68.97% after water solubility testing for 42 days, 72.09% for 240 days, and 72.75% for 365 days, respectively, indicating the sample could be used as a long-term slow-release potassium fertilizer with nutrient K_2O release.

Biography

Jiangyan Yuan has her expertise in Material Science and Engineering. Her research interests consist of comprehensive utilization and green processing of mineral resources, such as hydrothermal leaching of valuable elements, hydrothermal synthesis of zeolite; crystal structure transformation; and preparation and characterization of nano-materials as well as their application.

yuanjy0609@163.com

Notes: