SINGLE CYRSTAL MANGANESE OXIDE SYNTHESIZED BY ORGANIC TEMPLATE CTAB

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Abstract

In this study, adding NaOH and manganese acetate ($Mn(CH_3COO)_2$) solution for the precursor, and cationic surfactant cetyltrimethyl ammonium brombide (CTAB) as a template to use their self-assembly characteristics, so that the precursor were attached to CTAB, prepared manganese oxide powder. By changing the weight percentage of CTAB solution, the surface of different types of manganese oxide. The use of XRD, SEM analysis of the structure of the manganese oxide and the surface patterns. The results showed that adding 15 wt% CTAB solution in the synthesis, there are α-Mn_2O_3 and Mn_3O_4 two-phase coexistence. With the increase in the concentration of CTAB added (30wt%), as (550^oC) after calcination, α-Mn_2O_3 phase also increased.The pore structure can be formed of truncated-octahedal manganese oxide crystal patterns.

Introduction

Manganese oxides have many technologicalapplications that result from their magnetic and catalyticproperties[1]. To surfactant CTAB of manganese oxide, because when the concentration of more than CTAB concentration after the CMC, CTAB will be in aqueous solution to form micelle. With the increasing concentration of CTAB, CTAB gathered in aqueous solution of the different patterns to form surfactant micelle, micelle rod and then hexagonal array micelle [2-3]. As the precursor of the type and concentration on the impact of manganese oxide very big [4-5].

So in the experiment, to change the concentration of CTAB, adding NaOH to change the phase of the manganese oxide and reduce the size of the powder. Therefore, changes in the concentration of CTAB, different precursors, the study of the effects of manganese oxide. Experimental CTAB solution to change the concentration of weight. Manganese acetate solution 75ml, the deployment of a different concentration of NaOH solution, 60 ml, and CTAB solution 75 ml, control and CTAB concentration of NaOH to the formation of manganese oxide truncated-octahedral crystal pattern.

Experimental

Will be adequate $Mn(CH_3COO)_2 \cdot 4H_2O$ dissolved in 75 ml deionized water, and stir to completely dissolve.The deployment of different concentrations of NaOH (aq) 60 ml, to the dropper infusion $Mn(CH_3COO)_2 \cdot 4H_2O$ solution, this solution precipitated the precipitation of yellow-white, manganese oxide as a synthesis of precursor.The deployment of the weight of different concentrations of CTAB solution 75 ml, Manganese acetate : NaOH : CTAB (1.25 : 1 : 1.25), add to 75 ^oC thermalbath, a stirring rod stirring after 15 min, the precursor of manganese aqueous solution into the mix, and continued stirring 30 min. Stir evenly, after 75 ^oC thermalbath standing in the 12 h, removed pending cooling, deionized water to wash and centrifuge separation, cleaning and centrifugal repeated six times and 60 ^oC in the drying oven. Will be placed in aluminum powder drying of the Crucible to 5 ^oC / min warming up to 550 ^oC, heated three hours after the furnace cooling to room temperature.

Results and Discussion

In the experiments, manganese acetate parameters fixed for 0.4M, CTAB concentration were 0wt%, 15wt% and 30 wt%, with the changes in the concentration of CTAB done to analyze the variables, NaOH solution to 0.08M. Added NaOH can be narrow particle size, with α-Mn_2O_3 and Mn_3O_4 two-phase coexistence.

The X-ray diffraction patterns of manganese oxide are shown in Figure 1, CTAB concentration in the 15wt%, is the amorphous state. CTAB concentration and calcining 30wt%, smaller peak, have a crystal. After matching found (Fig. 2) .To increase the concentration of CTAB, from its phase Mn_3O_4 into α-Mn_2O_3. Therefore, the concentration of CTAB is a very important parameter.

Figure 3 shows the SEM morphologies of as-prepared manganese oxides, (Fig.3a) for the CTAB 15wt% calcined not, as a result of CTAB added, the powder for the reunion. (Fig.3b) is CTAB 15wt% calcined 550 ^oC, because of CTAB were burned, so for the bulk of the powder. (Fig.3c) is not calcined CTAB 30wt%, due to the increase in the amount of CTAB, it is clear powder together. (Fig.3d) is CTAB 30wt% calcined 550 ^oC, the

Council found that the formation of manganese oxide octahedral angle cut crystal patterns.

Conclusion

CTAB concentration changes are important parameters, you can change the crystalline form, and add NaOH addition to the change of the manganese oxide phase, so that the powder can reduce the size, and we find out in the CTAB concentration 30wt%, NaOH 0.08 M by calcination can octahedral crystal patterns.

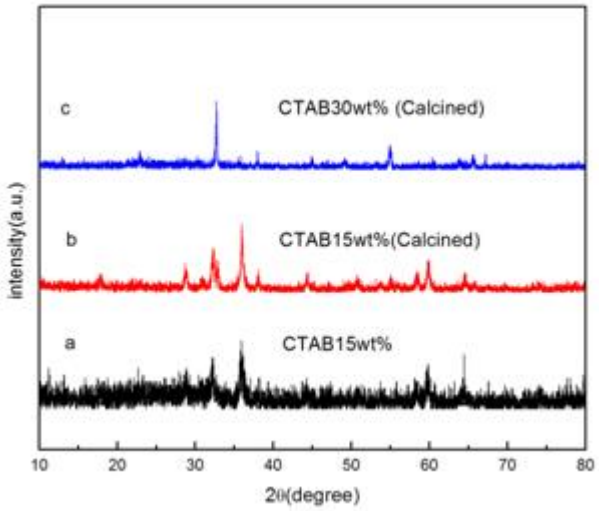

Figure 1. XRD pattern of manganese oxide, CTAB to add 15wt%~30wt% with 0.08M NaOH solution .(a)CTAB 15wt% not calcined, (b) CTAB 15wt% after calcinations 550 °C,(c) CTAB 30wt% after calcinations 550 °C.

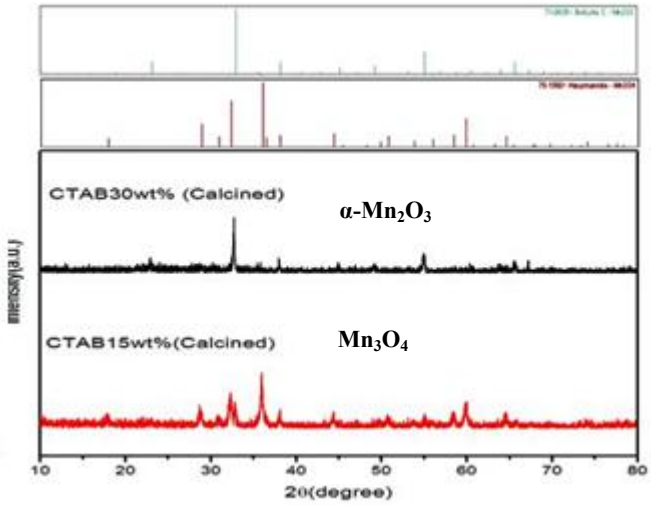

Figure 2. XRD pattern of manganese oxide, CTAB to add 15wt% ~ 30wt% of phase Mn_3O_4 change from α-Mn_2O_3.

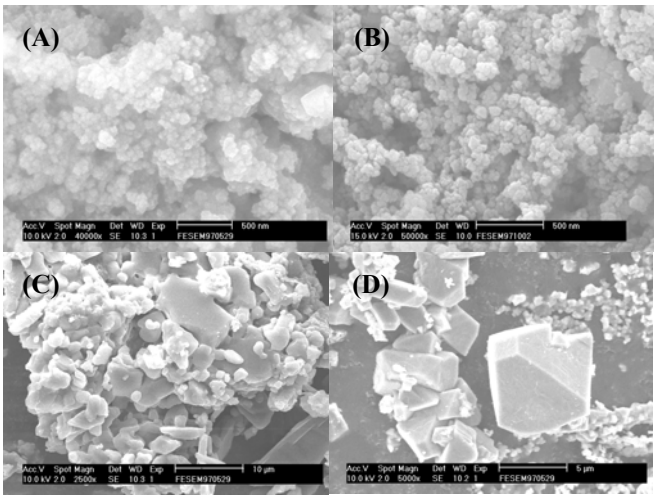

Figure 4. SEM images of products different concentrations (a) CTAB 15wt% not calcined (b) CTAB 15wt% after calcinations 550 °C (c) CTAB 30wt% not calcined (d) CTAB 30wt% after calcinations 550 °C.

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