HYDROTHERMAL SYNTHESIS AND CHARACTERIZATION OF NANO-FLAKE MAGNESIUM HYDROXIDES FROM MAGNESIUM OXIDE

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Magnesium hydroxide [$Mg(OH)_2$] has been extensively studied with regard to its application in desulphurization [1], flame retardant [2], foodstuff [3], smoke letting [4], water treating [5] and so on. During the past decades, nanostructured $Mg(OH)_2$ has received a considerable interest due to their potential property modification and been supposed to apply in more areas. In general, $Mg(OH)_2$ have been synthesized by a coprecipitation reaction between magnesium salt and sodium hydroxide. Some additives, such as surface modified agent [6], polymer [7] and copolymer [8] were employed in most of the nanostructured $Mg(OH)_2$ preparation processes. They remained in the final products and acted as baleful impurity in its application. Here, a simple, mild and environment-friendly hydrothermal method was suggested, where magnesium oxide [MgO] was used alone as a reactant without further additives.

In this work, $Mg(OH)_2$ was prepared by a simple hydrothermal reaction of bulk magnesium oxide , which shows random size distribution and micro size. Magesium oxide, 5, 10, and 20 wt%, respectively, were dispersed and agitated in 50 ml of distilled water were agitated and then heated up to 150°C in the Teflon-lined stainless steel hydrothermal reactor for 3, 6, 10, 12, and 24hours, respectively. The obtained powder was rinsed with distilled water and dried at 80°C. The obtained $Mg(OH)_2$ product was hexagonal shaped nano-flake. Crystalline structure of $Mg(OH)_2$ samples was analysed by XRD and shape and size of $Mg(OH)_2$ samples were confirmed by SEM. Relative surface areas of samples were calculated from the isotherm nitrogen adsorption-desorption experiments. The primary particle size of samples was in the range of several hundreds of nano meters and the thickness of samples under 100 nano meter (Fig.1). The thickness of nano-flake $Mg(OH)_2$ were varied with the change of reaction time. Thus, the thickness of nano-flake (below 100 nm) is controllable by changing the reaction time. Relative surface area of the $Mg(OH)_2$ (20%MgO, 10hrs) was calculated to 26 m^2/g by BET equation. In conclusion, the mass production of the nano-flake $Mg(OH)_2$ has been achieved by the simple hydrothermal reaction.

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References:

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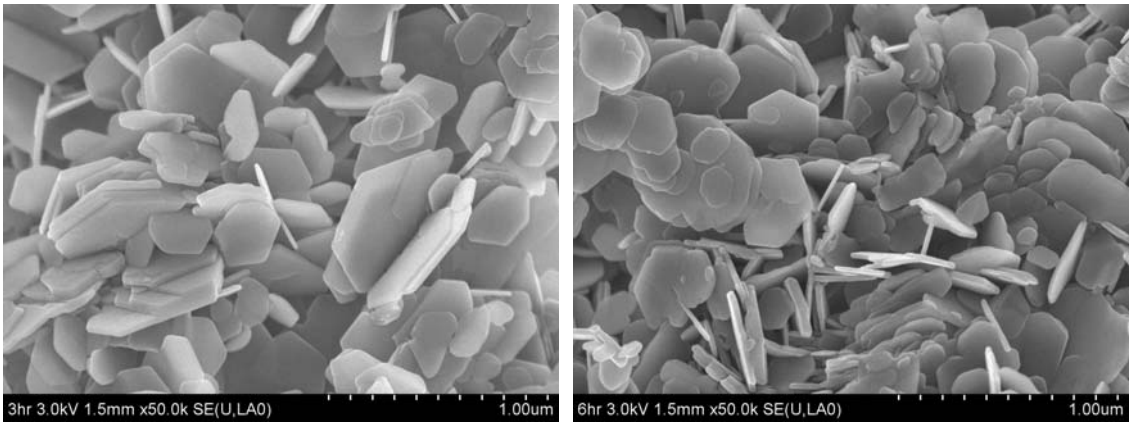
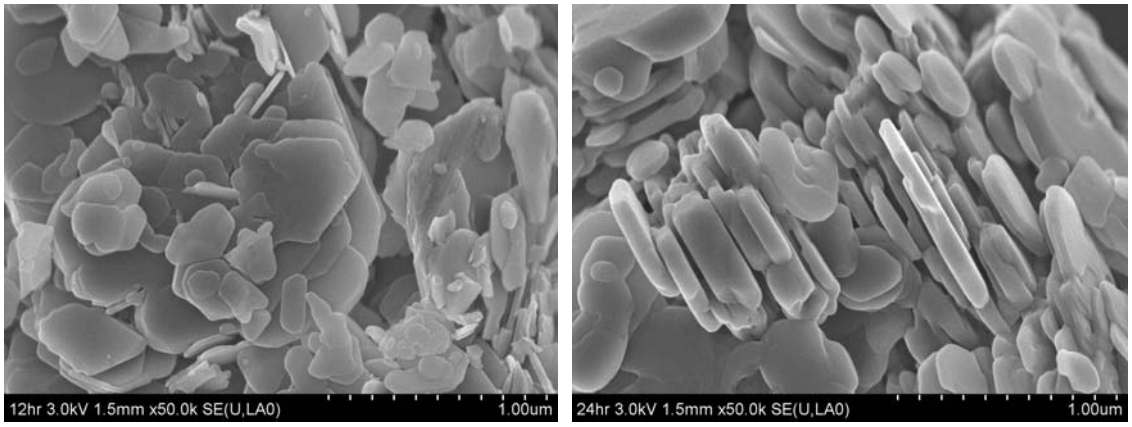
Figures:

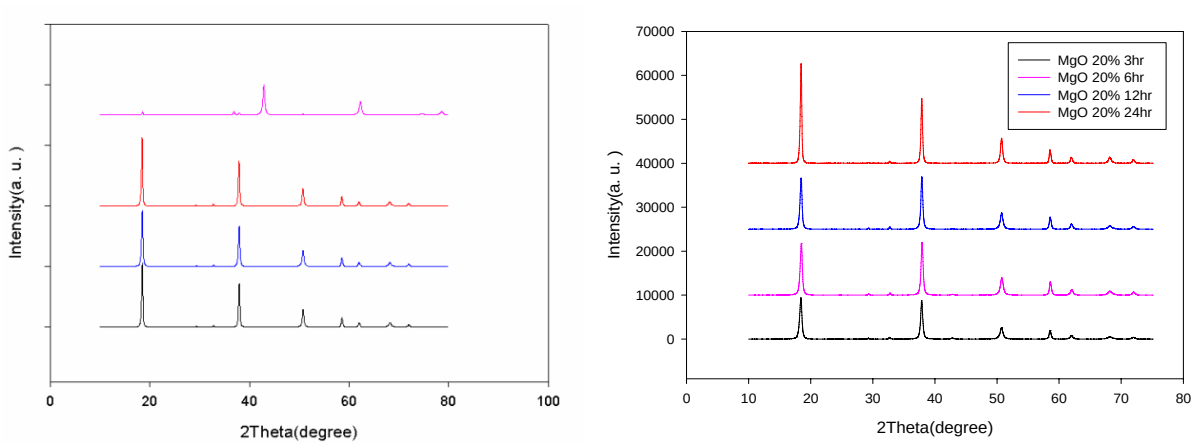


(a) **(b)**



(c) **(d)**

Fig. 1 SEM images of various $Mg(OH)_2$ samples. (a) 3 (b) 6 (c) 12 (d) 24hours hydrothermal reaction(20% MgO).



(a) **(b)**

Fig. 2 XRD spectra of the samples (a) MgO, $Mg(OH)_2$(5% MgO, 24h), $Mg(OH)_2$(10%MgO 24h) $Mg(OH)_2$(20% MgO 24h); from top to bottom (b)various reaction time.