ABSTRAK

STUDI AWAL REAKSI MEKANOKIMIA SERBUK $La(OH)_3$ MELALUI PROSES *MILLING* TERHADAP MORFOLOGI, KOMPOSISI KIMIA, UKURAN PARTIKEL, DAN STRUKTUR KRISTAL

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$La(OH)_3$ telah disintesis menggunakan metode *ball milling* dengan gas hidrogen untuk mempelajari reaksi mekanokimia yang terjadi pada material. Proses *ball milling* dilakukan dengan dua set parameter. Pada set pertama, tekanan gas hidrogen sebesar 9,39 bar, massa serbuk 8 gram, kecepatan 300 RPM, dan durasi proses 14 hari dengan total waktu *milling* selama 96 jam. Pada set kedua, tekanan gas hidrogen sebesar 2,34 bar, massa serbuk 2 gram, kecepatan 600 RPM, dan durasi proses juga 14 hari dengan total waktu *milling* selama 96 jam. Selain itu, serbuk yang tidak mengalami *milling* dianalisis untuk menyelidiki morfologi dan komposisi kimia $La(OH)_3$ melalui karakterisasi SEM-EDS, PSA, dan XRD. Proses mekanokimia pada serbuk $La(OH)_3$ melalui *milling* menghasilkan perubahan signifikan pada morfologi, ukuran partikel, dan struktur kristal. Proses *milling* menyebabkan aglomerasi partikel namun juga menghomogenkan ukuran partikel yang awalnya terdiri dari dua populasi (100 nm dan 10.000 nm), menjadi rata-rata sekitar 344,7 nm (MT_1) dan 375,0 nm (MT_2). Selain itu, distribusi ukuran partikel menjadi lebih seragam dengan penurunan PDI. *Milling* juga mengurangi ukuran kristalit, meningkatkan mikro regangan, serta menurunkan fase $La(OH)_3$ dari 94% menjadi 41%, diikuti dengan kemunculan fase La dan H_2 yang menunjukkan perubahan dalam kristalinitas material.

Kata kunci: $La(OH)_3$, mekanokimia,*ball milling*, gas hidrogen.

ABSTRACT

PRELIMINARY STUDY OF THE MECHANOCHEMICAL REACTION OF La(OH)3 POWDER THROUGH *MILLING* PROCESS ON MORPHOLOGY, CHEMICAL COMPOSITION, PARTICLE SIZE, AND CRYSTAL STRUCTURE

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$La(OH)_3$ was synthesized using the *ball milling* method with hydrogen gas to study the mechanochemical reactions occurring in the material. The *ball milling* process was carried out with two sets of parameters. In the first set, the hydrogen gas pressure was 9.39 bar, the powder mass was 8 grams, the speed was 300 RPM, and the process duration was 14 days with a total milling time of 96 hours. In the second set, the hydrogen gas pressure was 2.34 bar, the powder mass was 2 grams, the speed was 600 RPM, and the process duration was also 14 days with a total milling time of 96 hours. Additionally, unmilled powder was analyzed to investigate the morphology and chemical composition of $La(OH)_3$ through SEM-EDS, PSA, and XRD characterization. The mechanochemical process on $La(OH)_3$ powder through milling resulted in significant changes in morphology, particle size, and crystal structure. The milling process caused particle agglomeration but also homogenized the particle size, which initially consisted of two populations (100 nm and 10,000 nm), to an average of approximately 344.7 nm (MT_1) and 375.0 nm (MT_2). Furthermore, the particle size distribution became more uniform with a decrease in PDI. Milling also reduced the crystallite size, increased the microstrain, and decreased the $La(OH)_3$ phase from 94% to 41%, accompanied by the appearance of La and H_2 phases, indicating changes in the material's crystallinity.

Keywords: $La(OH)_3$, mechanochemistry, *ball milling*, hydrogen gas.