

Sonication accelerated formation of Mg-Al-phosphate layered double hydroxide via sol-gel prepared mixed metal oxides

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Supplementary Information

The samples nomenclature

- $\text{Mg}_2\text{Al}_{(\text{MMO})}$ – mixed metal oxide with the cation ratio $\text{Mg}/\text{Al}=2$ obtained by calcination of nanopowder prepared using sol-gel based method.
- $\text{Mg}_2\text{Al}-\text{OH}_{(\text{T}^\circ\text{C}/\text{X})}$, $\text{Mg}_2\text{Al}-\text{OH}_{(\text{Sonic}/\text{X})}$ – hydroxide-intercalated Mg_2Al LDHs produced by hydration of $\text{Mg}_2\text{Al}_{(\text{MMO})}$ for time X either at fixed temperature T($^\circ\text{C}$) or at a high-power sonication applied, respectively.
- $\text{Mg}_2\text{Al}-\text{Cl}_{(\text{T}^\circ\text{C}/\text{X})}$, $\text{Mg}_2\text{Al}-\text{Cl}_{(\text{Sonic}/\text{X})}$ – chloride intercalated Mg_2Al LDHs prepared by anion exchange from $\text{Mg}_2\text{Al}-\text{OH}_{(25^\circ\text{C}/24\text{h})}$ for time X either at fixed temperature T($^\circ\text{C}$) or at a high-power sonication applied, respectively.
- $\text{Mg}_2\text{Al}-\text{H}_x\text{PO}_4(\text{T}^\circ\text{C}/\text{X})$, $\text{Mg}_2\text{Al}-\text{H}_x\text{PO}_4(\text{Sonic}/\text{X})$ – phosphate intercalated Mg_2Al LDHs prepared by anion exchange from $\text{Mg}_2\text{Al}-\text{Cl}_{(25^\circ\text{C}/24\text{h})}$ for time X either at fixed temperature T($^\circ\text{C}$) or at a high-power sonication applied, respectively.

X-ray diffraction (XRD) study

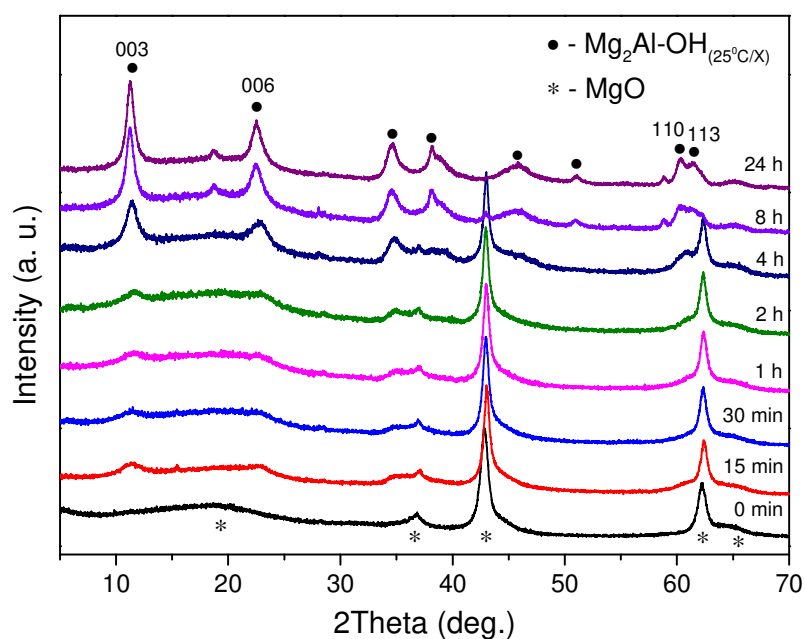


Figure S1. XRD patterns of the products obtained as a result of hydration of $\text{Mg}_2\text{Al MMO}$ at room temperature for different time from 15 min to 24 h. The pattern of the as-prepared $\text{Mg}_2\text{Al}_{(\text{MMO})}$ is shown for a comparison.

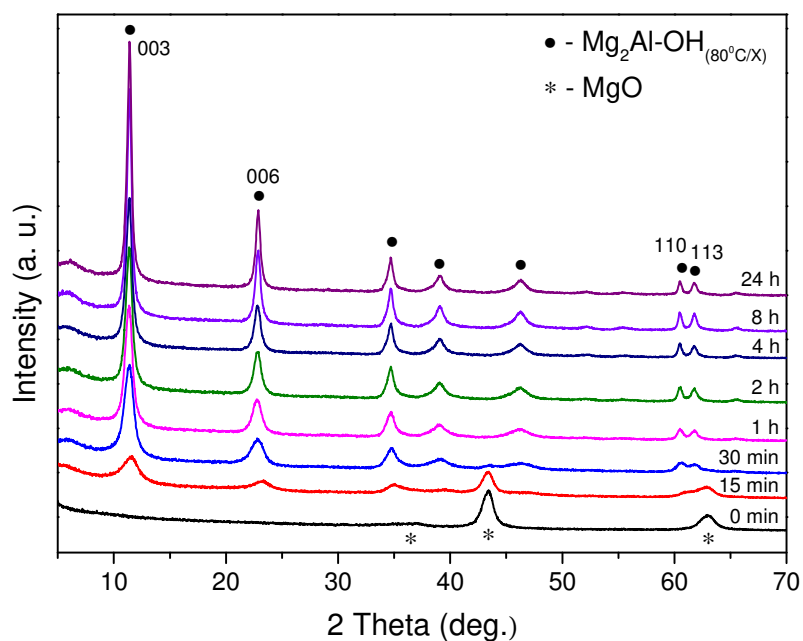


Figure S2. XRD patterns of the products obtained as a result of hydration of $\text{Mg}_2\text{Al MMO}$ at 80°C for different time from 15 min to 24 h. The pattern of the as-prepared $\text{Mg}_2\text{Al}_{(\text{MMO})}$ is shown for a comparison.

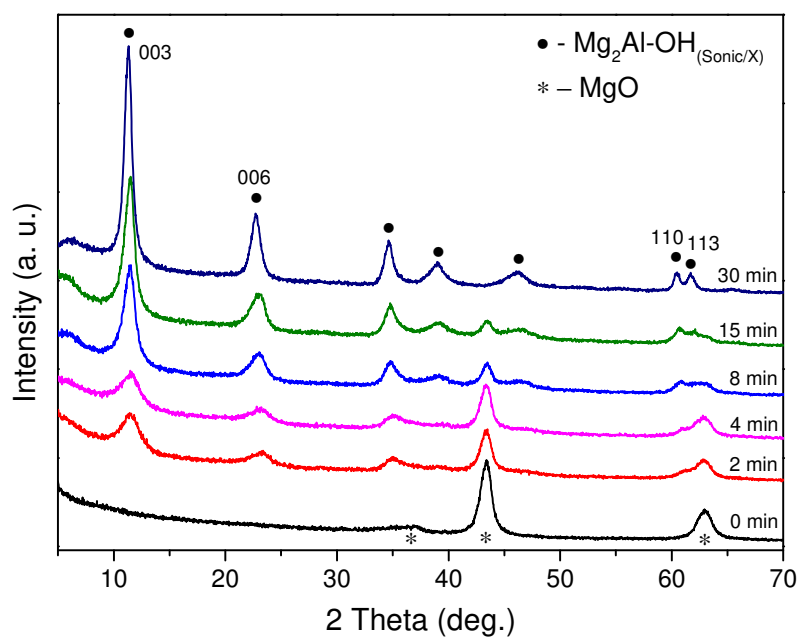


Figure S3. XRD patterns of the products obtained as a result of high-power sonication accelerated hydration of $\text{Mg}_2\text{Al MMO}$ for different time from 2 to 30 min. The pattern of the as-prepared $\text{Mg}_2\text{Al}_{(\text{MMO})}$ is shown for a comparison.

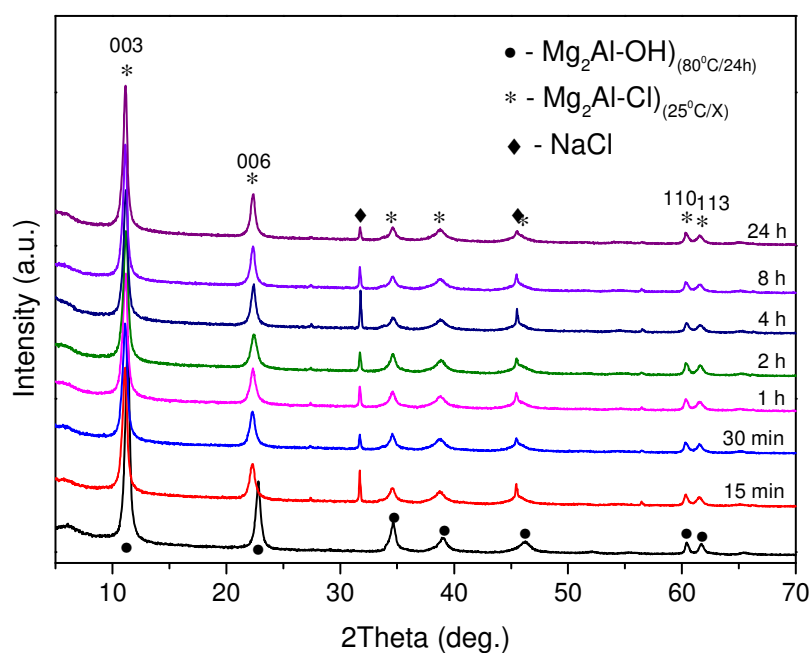


Figure S4. XRD patterns of the products obtained as a result of a hydroxide-to-chloride anion exchange in $\text{Mg}_2\text{Al-OH}_{(80^\circ\text{C}/24\text{h})}$ LDH at room temperature for different time from 15 min to 24 h.

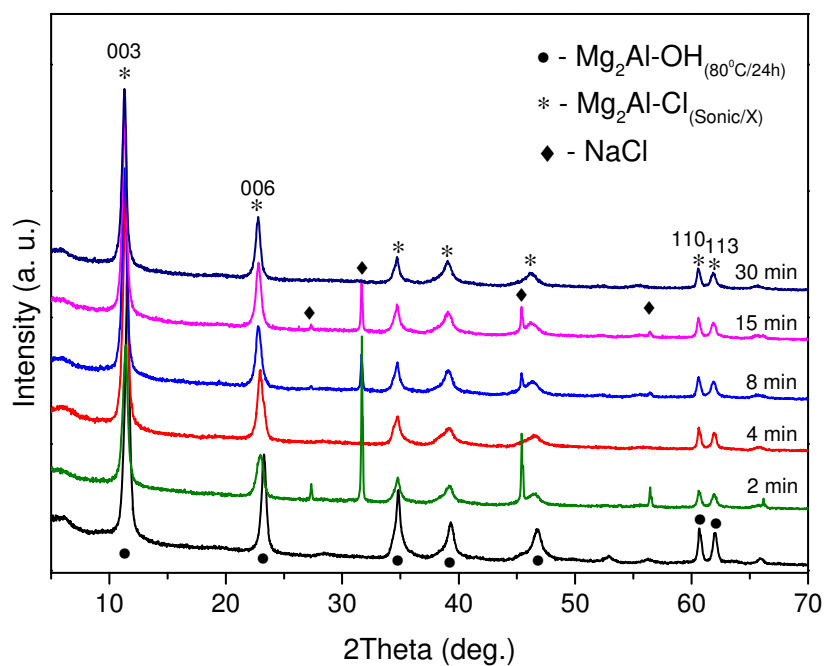


Figure S5. XRD patterns of the products obtained as a result of a high-power sonication accelerated hydroxide-to-chloride anion exchange in $\text{Mg}_2\text{Al-OH}_{(80^\circ\text{C}/24\text{h})}$ LDH for different time from 2 to 30 min.

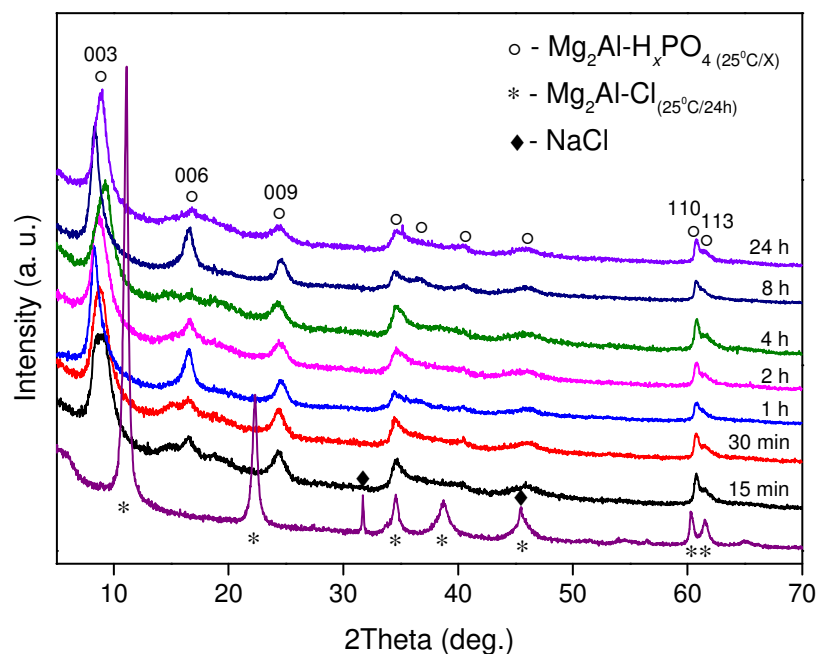


Figure S6. XRD patterns of the products obtained as a result of a chloride-to-phosphate anion exchange in $\text{Mg}_2\text{Al-Cl}_{(25^\circ\text{C}/24\text{h})}$ LDH at room temperature for different time from 15 min to 24 h.

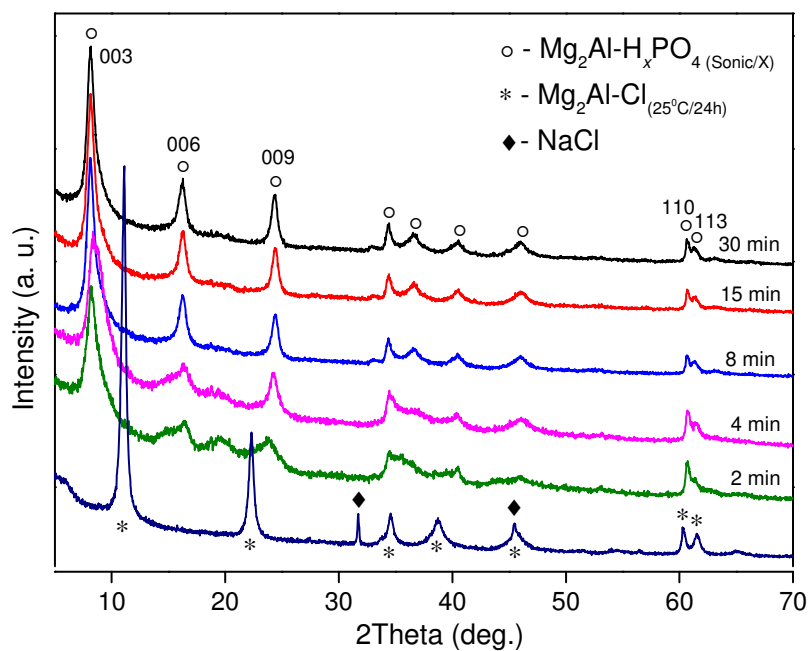


Figure S7. XRD patterns of the products obtained as a result of a high-power sonication accelerated chloride-to-phosphate anion exchange in $\text{Mg}_2\text{Al}-\text{Cl}_{(25^\circ\text{C}/24\text{h})}$ LDH for different time from 2 to 30 min.

Thermogravimetric (TG) analysis

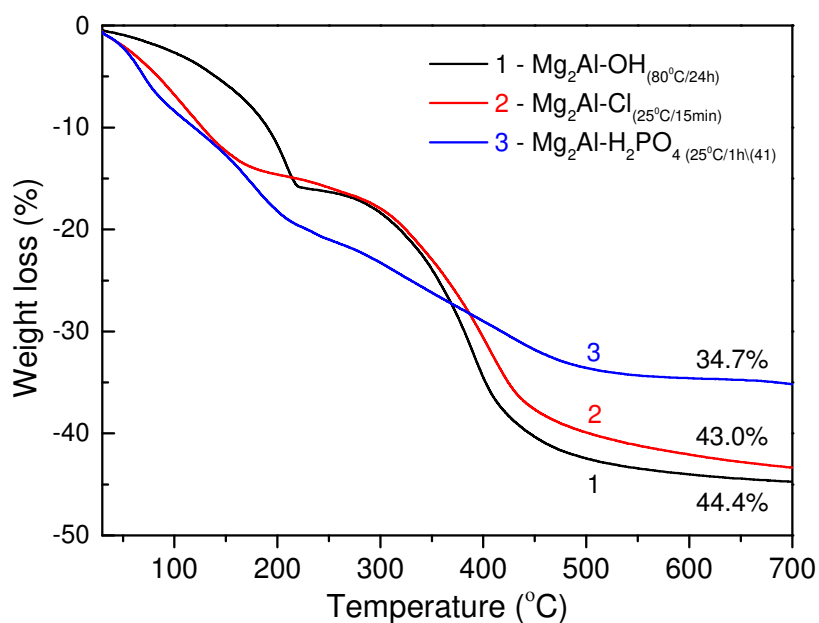


Figure S8. TG analysis curves of the LDHs obtained via hydration and anion exchanges without application of high-power ultrasound.