Research paper

Chemical stability of Laponite in aqueous media

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In this work the stability of Laponite against dissolution in its aqueous dispersions is investigated as a function of initial pH of water before mixing Laponite, and concentration of Laponite. Dissolution of Laponite is quantified in terms of the concentration of leached magnesium in the dispersions. Interestingly the solvent pH is observed to play no role in the dissolution of Laponite in dispersion over the explored range of 3 to 10. Furthermore, contrary to the usual belief that Laponite dissolves when the pH of aqueous dispersion decreases below 9, the dissolution of the same is observed even though dispersion pH is above 10 for low concentrations of Laponite (1 and 1.7 mass%). On the other hand, for dispersions having a high concentration of Laponite (2.8 mass%) and pH in the similar range (~10) no dissolution is observed. Measurement of ionic conductivity of dispersion shows that the concentration of sodium ions in dispersion increases with the concentration of Laponite, which appears to have a role in preventing the dissolution of Laponite.

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1. Introduction

Laponite, a synthetic clay mineral, is known to have widespread applications as a rheology modifier and as a reinforcement in a variety of industries such as mining, petroleum, home and personal care, pharmaceutical, agrochemical, and paint polymer etc. The primary particle of Laponite possesses anisotropic nanometric shape that has dissimilar charge distribution. Consequently its dispersion in water shows a rich variety of phase behaviors (Jabbari-Farouji et al., 2008; Mongondry et al., 2005; Mourchid et al., 1995; Ruzacka and Zaccarelli, 2011; Shahin and Joshi, 2012; Shahin et al., 2011; Sun et al., 2012; Tudisca et al., 2012). In addition, it attracts applications as an active agent in many water based formulations (Chadiri et al., 2013; Negrete et al., 2004; Sun et al., 2009). The dependence of physical properties of Laponite dispersion on time, particularly the observed increase in modulus and relaxation time, is reminiscent of physical aging in molecular and spin glasses (Dhavale et al., 2013; Morariu and Bercea, 2012; Schosseler et al., 2006; Shahin and Joshi, 2011). Owing to this, aqueous dispersion of Laponite is also investigated as a model soft glassy material (Bandyopadhyay et al., 2004; Bonn et al., 2002). Over the past two decades Laponite in aqueous dispersion as well as in other multi-component systems has attracted enormous attention from the academia as well as from the industry. However, Laponite is reported to have a major shortcoming related to its chemical stability. According to Thompson and Butterworth (1992), Laponite particles undergo dissolution in the aqueous media having pH less than 9. Interestingly despite vast literature available on this clay mineral, very few papers study the chemical stability of Laponite dispersion, which is a subject of this work. It is observed that Laponite particles in dispersion are prone to dissolution even at high pH and the chemical stability of the same strongly depends on the concentration of Laponite.

Laponite has a chemical formula given by: Na0.7Si8Mg5.5Li0.3O20(OH)4. Laponite particles are disk shaped with a thickness of 1 nm and diameter of 25 ± 2 nm (Kroon et al., 1998). In a single layer of Laponite two tetrahedral silica sheets sandwich one octahedral magnesia sheet. In the middle octahedral sheet few magnesium atoms are substituted by lithium atoms (isomorphic substitution) creating a deficiency of positive charge within the sheet. Consequently, in a dry state, the faces of Laponite particles, that are electron rich, share the electrons with sodium atoms that reside in the interlayer space. Upon dispersing in the aqueous media the Na+ ions dissociate rendering a permanent negative charge to the faces of Laponite particles. The edge of Laponite particle predominantly contains MgOH groups from the octahedral magnesia sheets. The point of zero charge (PZC), for oxides and hydroxides of magnesium is above pH of 10 (Kosmulski, 2001). Martin et al. (2002) mentioned that according to the manufacturer (Laponite Technical Bulletin, 1990) the edge of Laponite particle, which contains predominantly MgOH, is positive below pH of 11 indicating pH of 11 to be a point of zero charge for the edges of Laponite particles. Depending upon the pH of the medium, either H+ or OH− ions dissociate from the edges rendering the same negative or positive charge respectively. The dissociation of H+ ions from the edge occurs only above the pH associated with PZC to acquire the negative charge. Consequently the pH of the dispersion decreases. Below the pH associated with PZC, the edge of Laponite particle releases OH− ions,
which causes an increase in the pH of the dispersion. Therefore, depending upon whether H\(^+\) or OH\(^-\) ions dissociate from the edge, the pH of dispersion respectively decreases or increases (Tawari et al., 2001), and the resultant value of the pH of Laponite dispersion has a strong influence on the stability of the same.

According to available literature, the first study on the chemical stability of hectorite in aqueous media is due to Tiller (1968). He estimated leaching of magnesium ions from naturally occurring purified hectorite using atomic absorption spectroscopy. He observed that the concentration of leached magnesium increases with the decrease in pH but remains practically independent of the concentration over the explored range of 0.1 to 0.4 mass%. The first investigation on the chemical stability of Laponite, which is a synthetic hectorite, in aqueous dispersion was performed by Thompson and Butterworth (1992). They systematically studied the effect of the pH of the medium on the stability of Laponite dispersion in the low concentration regime (below 2 mass%). They observed a detectable dissolution of Laponite below pH of 9. They proposed that such dissolution follows a chemical reaction given by:

\[
\text{Na}_2\text{Si}_{5.5}\text{Mg}_{1.5}\text{Li}_0.5\text{O}_{20}(\text{OH})_4 + 12\text{H}^+ + 8\text{H}_2\text{O} \rightarrow 0.7\text{Na}^+ + 8\text{Si}(\text{OH})_4^- + 5.3\text{Mg}^{2+} + 0.4\text{Li}^+
\]

(1)

wherein excess of H\(^+\) ions causes leaching of magnesium ions from the particles. There is a slight difference between the formula for Laponite mentioned by Thompson and Butterworth (1992) and that adapted in this work. Thompson and Butterworth suggested the formula to be \(\text{Na}_0\text{Si}_{5.5}\text{Mg}_{4.5}\text{Li}_0.5\text{O}_{20}(\text{OH})_4\), while this work subscribes to the formula suggested by the manufacturer. The above reaction therefore has been stoichiometrically corrected to suit Laponite used in this study.

Mourchid and Levitz (1998) studied long term gelation of aqueous dispersion of Laponite having a low concentration of Laponite (1 and 1.5 mass%). They observed that samples preserved under inert conditions (nitrogen atmosphere in this case) do not undergo dissolution (do not show any traces of Mg\(^{2+}\) ions). On the other hand, the samples that are merely sealed indeed show presence of Mg\(^{2+}\) ions, which increases as a function of time. They report that all the samples wherein the concentration of Mg\(^{2+}\) ions is observed to be greater than 0.5 mM form viscoelastic gels. They claim that the dissolution of atmospheric CO\(_2\) is sufficient to create an acidic environment which according to reaction (1) leads to leaching of Mg\(^{2+}\) ions. Interestingly Mourchid and Levitz (1998) prepare the dispersions of Laponite in water having pH 10. However they do not report the pH of dispersion when the presence of Mg\(^{2+}\) ions was observed. Apparently studies by Thompson and Butterworth (1992) and Mourchid and Levitz (1998) are the only two reports available in the literature on the chemical stability of Laponite dispersion. Both the reports suggest the possibility of leaching of Mg\(^{2+}\) ions when the pH of dispersion is below 9.

### 2. Materials and experimental procedure

Laponite XLC\(^@\) used in this study is obtained from Southern Clay Products Inc. Laponite is dried for 4 h at 120 °C to remove the moisture and is subsequently mixed with Millipore water (Resistivity = 18.2 M\(\Omega\) cm) having pH in the range of 3 to 10. For maintaining the acidic pH two reagents have been used, namely: citric acid buffers as well as HCL. Citric acid buffers are prepared by incorporating 0.1 M citric acid and 0.1 M tri-sodium citrate solutions in water. In order to maintain the basic pH, NaOH has been employed. In some samples, NaCl has also been incorporated. Once the predetermined initial pH of water and salt concentration are obtained the dried Laponite powder is added to the same. Dispersion is stirred using an Ultra Turrax drive for a period of 45 min. The dispersions are then stored in sealed polypropylene bottles without any nitrogen purging. After the sample preparation bottles are filled in such fashion that they have around 200 ml of open space filled with air above the sample. However, the bottles are opened in order to take out the sample for pH and Mg\(^{2+}\) ion concentration measurements at predefined interval of days (duration between two consecutive samples vary between 1 and 5 days). The list of samples studied in this work with respect to concentrations of Laponite and initial pH is reported in Table 1. Throughout in this paper the pH of water before mixing Laponite is represented as pH\(_0\). On the other hand, the pH of dispersion (after the addition of Laponite) is termed as pH\(_f\), which is observed to depend on time.

In order to detect the concentration of Mg\(^{2+}\) ions in Laponite dispersion, complexometric titration is performed on dispersion samples at a regular interval after the preparation of the same. Complexometric titration is performed with EDTA using eriochrome black-T as an indicator. If dispersion contains Mg\(^{2+}\) ions, it turns red or purple upon the addition of eriochrome black-T indicator. The method is so sensitive that it can detect the concentration of Mg\(^{2+}\) ions as small as 10\(^{-3}\) mM (Vogel, 1978). The details of complexometric titration procedure can be found elsewhere (Vogel, 1978). It is important to note that Laponite dispersion forms a high viscosity/elasticity gel, and therefore, in principle, the titration of the same in this form is difficult. However, Laponite gel is thixotropic, therefore its viscosity/elasticity can be reduced significantly by simply shearing it vigorously. Therefore, it has been made sure that the gel viscosity has reduced significantly by shearing it to the extent possible so that it is in liquid state at the time of titration. The changes in ionic conductivity and pH\(_f\) were also measured as a function of time using Eutech Cyberscan CON 6000 pH and conductivity meter with a 4 cell conductivity electrode (range 0–500 mS and temperature range 0–70 °C) and an open pore double reference junction Ag/AgCl pH electrode (range pH 0–14 and temperature 0–80 °C). All the experiments are performed at 25 °C.

### 3. Results and discussion

Upon incorporating Laponite in water the nature of resultant dispersion is strongly influenced by pH\(_f\) and reagents used to maintain the pH\(_f\). Particularly, 2.8 mass% dispersions have been prepared in water with pH\(_f\) between 3 and 10. As mentioned before, in order to maintain acidic pH\(_f\), two reagents namely citric acid buffer and HCl are used. It is observed that when pH\(_f\) is maintained (in the range of 3 to 10) by using either HCl or NaOH, dispersions of 2.8 mass% Laponite are transparent and eventually acquire a soft solid like consistency. On the other hand, when citric acid buffer is used to maintain pH\(_f\) of 3 and 4, resultant 2.8 mass% dispersions show sedimentation wherein Laponite settles down within a day. However, for pH\(_f\) = 6 (obtained by citric acid buffer) 2.8 mass% dispersion does not undergo sedimentation, but becomes hazy and remains in the liquid state throughout the observation period of 30 days. In addition, 1 and 1.7 mass% dispersions are also prepared in water having pH\(_f\) between 7 and 10. It is observed that 1 mass% dispersion remains in liquid state without noticeable change in viscosity over a period of 30 days. Dispersions having 1.7 mass% concentration also remain in liquid state but become progressively more viscous over the observation period of 30 days.

The incorporation of Laponite in water, depending upon pH\(_f\), leads to dissociation of OH\(^-\) ions from its edge. Such dissociation in turn causes an increase in the pH\(_f\) of the dispersion. In Figs. 1 and 2 the evolution of pH\(_f\) is plotted as a function of number of days since the preparation of the same for different concentrations of Laponite. For 1 and

<table>
<thead>
<tr>
<th>Laponite conc. (mass%)</th>
<th>Acidic pH(_f) (no salt)</th>
<th>Neutral and basic pH(_f) (no salt)</th>
<th>Concentration of NaCl (mM) with pH(_f) = 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>–</td>
<td>pH(_f) = 7, 8, 9 and 10.</td>
<td>11.1</td>
</tr>
<tr>
<td>1.7</td>
<td>–</td>
<td>Basic pH(_f) maintained by NaOH</td>
<td>7.2</td>
</tr>
<tr>
<td>2.8</td>
<td>pH(_f) = 3, 4 and 6 maintained by citric acid buffer as well as HCl</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
over a period of 30 days pHf still remains above 10. Furthermore, a lesser
variation having pHf in the range of 3 to 10 maintained by either HCl or
around pH of 11 for the edge of Laponite particle (Martin et al., 2002),
It should be noted that below a point of zero charge (PZC), which is
of days after preparing the same in citric acid buffer solution (half
Evolution of pHf of 2.8 wt.% Laponite dispersion plotted as a function of number of days since the
pHi = 7 to 10 (and pHf 
edges acquire a positive charge by dissociating OH− ions. Such dissoci-
ation of OH− ions raises the pH of the aqueous medium in which Laponite
particles are dispersed in. Since the dissociation of OH− ions from the
edges of Laponite particle depends upon the pH of the surrounding
aqueous medium and not the initial pH, at pH of 10.4 the dissociation
from the edge starts and pH does not increase any further.
In Fig. 3, the comparison of the results of Figs. 1 and 2 are shown,
wherein pHi on day 5 was plotted as a function of pHi. It can be seen
that dispersions prepared in citric acid buffer show a qualitatively differ-
ent behavior than the rest of the dispersions. This different behavior can
be understood as follows. In aqueous solution, the incorporation of an
incremental amount of acid or base (or a compound that tends to re-
lease OH− or H+ ions) tends to change its pHi gradually. In a buffer,
the on the other hand, a mixture of weak acid (in this case citric acid) and
its conjugate base (in the present case tri-sodium citrate) is used,
which causes only a small change in pHi even when a strong acid or
base is incorporated in the same. Buffer solutions tend to resist change
in pHi owing to the equilibrium between acid and its conjugate base
(Bettelheim et al., 2009). This aspect is very evident from Fig. 2. Conse-
quently the pHf of Laponite dispersion prepared in citric buffer always
remains below 9.
The change in pHi upon the incorporation of Laponite in water has
an important consequence as the resultant pHi of Laponite dispersion,
as reported in the literature, is proposed to affect the chemical stability
of the Laponite particles in the dispersion. As discussed before, in the
presence of H+ ions, Laponite particles undergo reaction (1), which
results in leaching of magnesium (Mg+2) and lithium (Li+) ions. In this
work, the estimation of the concentration of Mg+2 ions is carried out
by the complexometric titration of Laponite dispersions at regular inter-
vals. The corresponding measured concentration of Mg+2 ions for three
concentrations of Laponite as a function of number of days since the
preparation of the same is plotted in Fig. 4. Laponite dispersions having
2.8 mass% concentration with acidic pHi obtained by citric acid buffer
and pHi < 9 for all samples) shows a significant amount of leaching of
Mg+2 ions, whose magnitude also increases with time as shown in
Fig. 4a. For dispersions having, concentrations 1 and 1.7 mass% and
pHi = 7 to 10 (and pHf > 10 for all samples) also shows the measurable
presence of Mg+2 ions at very early age, which increases with time. In-
terestingly the magnitude of Mg+2 ions present in 2.8 mass% dispersion
with pHi maintained by citric acid buffer is observed to be significantly
greater in magnitude than lower concentration dispersions whose pHi
is maintained by NaOH. However, most surprisingly, for 2.8 mass%
Laponite dispersion with pHi = 3 to 10 maintained by adding HCl or
NaOH, no traces of Mg+2 ions are observed over the explored duration
of 30 days.
As mentioned in the Introduction section, the very first report on the
chemical stability of Laponite by Thompson and Butterworth (1992)
claims that particles of Laponite undergo dissolution leading to leaching
of Mg+2 ions when pHi decreases below 9. However the present study
clearly demonstrates that even though the pHi is above 10, leaching of
Mg+2 ions does take place in the dispersions having a low Laponite con-
centration. Surprisingly the dispersions with 2.8 mass% concentration,
although has pHi in the similar range as that of the low concentration
dispersions, do not show any measurable presence of Mg+2 ions. Even
though the overall pHi is basic, as suggested by Mourchid and Levitz
(1998), the dissolution of atmospheric CO2 in water produces carbonic
acid and hence H+ ions locally according to (Greenwood and Earnshaw,
1997):
\[
\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-. \tag{2}
\]
Therefore continuous enhancement of Mg+2 ions reported in Fig. 4
can be attributed to the slow dissolution of CO2 from the atmosphere
that follows reactions (1) and (2).
The reason of this significant leaching of Mg+2 ions in 2.8 mass%
Laponite dispersion (pHi controlled by citric acid buffer) is the already

1.7 mass% Laponite dispersions with pHi in the range of 7 to 10, the time
dependent evolution of pHf is shown in Fig. 1a and b respectively. It can
be seen that soon after mixing Laponite, pHf increases to values above
10. As time passes, pHf decreases weakly as a function of time, so that
over a period of 30 days pHf still remains above 10. Furthermore, a lesser
decrease in pHf is observed in dispersions prepared in water with greater
pHf.

Variation in pHf for 2.8 mass% Laponite dispersion for pHi in the
range of 3 to 10 is shown in Fig. 2. For 2.8 mass% Laponite dispersion
with acidic pHi (3 to 6) maintained by citric acid buffer, pHf increases
within the first 5 days and then remains constant. The value of constant
pHf always remains below 9. On the other hand, if the acidic pHi (3 to 6)
is maintained by HCl, the addition of 2.8 mass% Laponite causes an in-
crease in pHf, which also stabilizes within the first 5 days and remains
nearly constant at a value of 10.4 irrespective of the value of pHf. For
2.8 mass% dispersions with pHi in the range of 7 to 10 (basic pHi main-
tained by NaOH) the increase in their pHf values are also observed.
However regardless of pHi, pHf is observed to reach a constant level of
around 10.4 after 5 days. Interestingly for 2.8 mass% Laponite dispersion
having pHi in the range of 3 to 10 maintained by either HCl or
NaOH, pHf after 5 days is observed to be very similar and around 10.4.
It should be noted that below a point of zero charge (PZC), which is
around pH of 11 for the edge of Laponite particle (Martin et al., 2002),

![Fig. 1](image1.png)

**Fig. 1.** Evolution of pHf of (a) 1 mass% and (b) 1.7 mass% Laponite dispersions plotted as a function of number of days after preparing the same in water having pHi = 7 (squares), 8 (circles), 9 (up triangles) and 10 (diamonds). The lines serve as a guide to the eye.

![Fig. 2](image2.png)

**Fig. 2.** Evolution of pHf of 2.8 wt.% Laponite dispersion plotted as a function of number of days after preparing the same in citric acid buffer solution (half filled symbols) having pHi = 3 (stars), 4 (pentagons), and 6 (down triangles); in HCl solution (filled symbols) having pHi = 3 (stars), 4 (pentagons), and 6 (down triangles); and in NaOH solution (open symbols) having pHi = 7 (squares), 8 (circles), 9 (up triangles) and 10 (diamonds). The lines serve as a guide to the eye.
low pHf of dispersion compared to all the other dispersion samples aided by the dissolution of atmospheric CO2. The dissolution of Laponite in low concentration dispersion with pHf in the range of 7 to 10 and pHf ≈ 10.4 can be ascribed to the dissolution of atmospheric CO2, which leads to the generation of H+ ions locally. As soon as H+ ions are generated, there is competition between Laponite particles and OH− ions (associated with the basic environment). If H+ ions react with Laponite it will lead to dissolution. On the other hand, if H+ ions react with OH− ions, it will cause a decrease in pH. (In this work, as mentioned in Table 1, 1 and 1.7 mass% dispersions prepared in water having acidic pHf are not studied. Since even 1 and 1.7 mass% dispersions prepared in basic pHf, demonstrate leaching of Mg2+ ions, it is obvious that 1 and 1.7 mass% dispersions in water having acidic pHf will also show the dissolution of Laponite particles.) The stability of 2.8 mass% Laponite dispersion where pHf is controlled by HCl or NaOH (with pHf = 3 to 10 and pHf ≈ 10.4) observed in the third case is however puzzling.

It is known that CO2 has a significant affinity toward NaOH, and dissolved CO2 reacts with NaOH to first form sodium bicarbonate (CO2 + NaOH → NaHCO3) and finally sodium carbonate (NaHCO3 + NaOH → Na2CO3 + H2O). Therefore greater concentration of NaOH in solution/dispersion is expected to inhibit the formation of carbonic acid and H+ ions, and in turn prevents leaching of the Mg2+ ions. However, for 1, 1.7 and 2.8 mass% dispersions (with pHf maintained either by HCl or NaOH), the pHf is always around 10.4 over the explored period as shown in Figs. 1 to 3. Consequently the concentration of solvated NaOH is also the same in all these cases. This suggests that effects originating from a higher concentration of Laponite are able to prevent the reaction of CO2 and H2O that produces H+ ions.

In order to investigate the effect of Laponite concentration further, the ionic conductivity measurements of 1 and 1.7 mass% Laponite dispersions (pHf = 7 to 10 maintained by NaOH) and 2.8 mass% Laponite dispersion (pHf = 3 to 10 maintained by HCl or NaOH) are also carried out. In Fig. 5 ionic conductivity (σ) as a function of pHf is plotted (filled symbols) for different concentrations of Laponite. The reported conductivity is measured on day 5 after preparing the dispersion. It can be seen that the ionic conductivity of solvent as a function of pHf shows a minimum at 7. The corresponding ionic conductivity of Laponite dispersion, however, seems to be independent of pHf over the explored range but shows greater increase for a higher concentration of Laponite. The reason behind enhancement in the conductivity of water having certain pHf after the addition of Laponite is primarily due to the dissolution of Na+ counterions from the faces of the Laponite particles. Furthermore as shown in Fig. 3, the incorporation of Laponite in water having different pHf causes an increase in the pHf of the dispersion suggesting the dissociation of OH− counterions. Such dissociated OH− counterions from the edges are also responsible for the increase in ionic conductivity shown in Fig. 5.

The ionic conductivity (σ) of a solution/dispersion is related to the concentration of ith type of ion (ni) present in the same by (Benenson et al., 2002):

\[
\sigma = \varepsilon \sum_i \mu_i n_i, \tag{3}
\]

where \(\mu_i\) is the mobility of ith type of ion and \(\varepsilon\) is the electron charge. The dispersion of Laponite primarily contains Na+, OH−, H+ and Cl− ions, wherever applicable, that contributes to the ionic conductivity. However at the dispersion pHf of around 10.4, the concentration of H+ ions is very small to influence the conductivity. It is important to note that, leaching of Mg2+ and Li+ ions in 1 and 1.7 mass% dispersions has a very little effect on the ionic conductivity because of their small concentration compared to the other ions. Therefore, their effect is neglected in these calculations. The concentration of OH− ion can be directly obtained from the pHf of dispersion as \(n_{OH} = 10^{pOH−14}\). The Cl− ions are present only for those dispersions that are prepared in water having acidic pHf. Therefore the concentration of Cl− ions is given by: \(n_{Cl} = 10^{−pHf}\) (for pHf < 7). The knowledge of mobilities of the mentioned ions (\(\mu_{Na} = 5.19 \times 10^{−8}\) m2/sV, \(\mu_{Cl} = 7.908 \times 10^{−9}\) m2/sV and...
\[ \mu_{\text{H}} = 2.05 \times 10^{-7} \text{ m}^2/\text{sV} \] (Haynes, 2010) and conductivity (\( \sigma \)), therefore directly leads to the estimation of the concentration of Na\(^+\) ions in the dispersion.

For this, different aqueous dispersions are studied having different concentrations of Laponite (1, 1.7 and 2.8 mass%), different initial pH\(_i\) of water before mixing Laponite (from pH 3 to 10), and different reagents to maintain initial pH\(_i\) of water (citric acid buffer, HCl, and NaOH). When acidic pH\(_i\) of water is maintained by citric acid buffer in the range of 3 to 6, the incorporation of 2.8 mass% Laponite in the same is observed to raise the pH\(_f\) of the dispersions in between 7.5 and 9. For such dispersions, a significant amount of magnesium leaching is observed. On the other hand, when HCl or NaOH is used to maintain the pH\(_i\) of water before mixing in the range of 3 to 10, the incorporation of Laponite in the same raises its pH\(_f\) above 10 irrespective of the concentration of Laponite or the pH\(_i\) of water. Such enhancement is attributed to the dissociation of OH\(^-\) ions from the edges of the Laponite particles.

However, very importantly, although the pH\(_f\) of dispersion is above 10, leaching of magnesium ions is observed in low concentration dispersion (1 and 1.7 mass%) but not in high concentration dispersion (2.8 mass%). This observation is contrary to the usual belief that leaching of magnesium ions is possible only when the pH\(_f\) of dispersion is below 9. In order to investigate this intriguing behavior, the ionic conductivity of the dispersion is measured. Knowledge of the mobilities of various ions leads to the concentration of Na\(^+\) ions in the dispersion. It is observed that the concentration of Na\(^+\) ions in the dispersion increases with the increase in the concentration of Laponite but it is independent of the pH\(_i\) of water. Interestingly the incorporation of salt (NaCl) in 1 and 1.7 mass% dispersions, wherein the resultant concentration of Na\(^+\) ions is the same as that of 2.8 mass% dispersion, is also observed to prevent dissolution. Therefore, there is a possibility that greater concentration of Na\(^+\) ions might have a role in rendering greater stability to the Laponite dispersions against dissolution.

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