

INVESTIGATION OF NEW NONTOXIC NANO CLAY COMPOSITE IN ORDER TO REMOVE PERMANENT HARDNESS OF WATER AND INTRODUCING A NEW ECOFRIENDLY CLAY DISK TO REMOVE IT EFFICIENTLY

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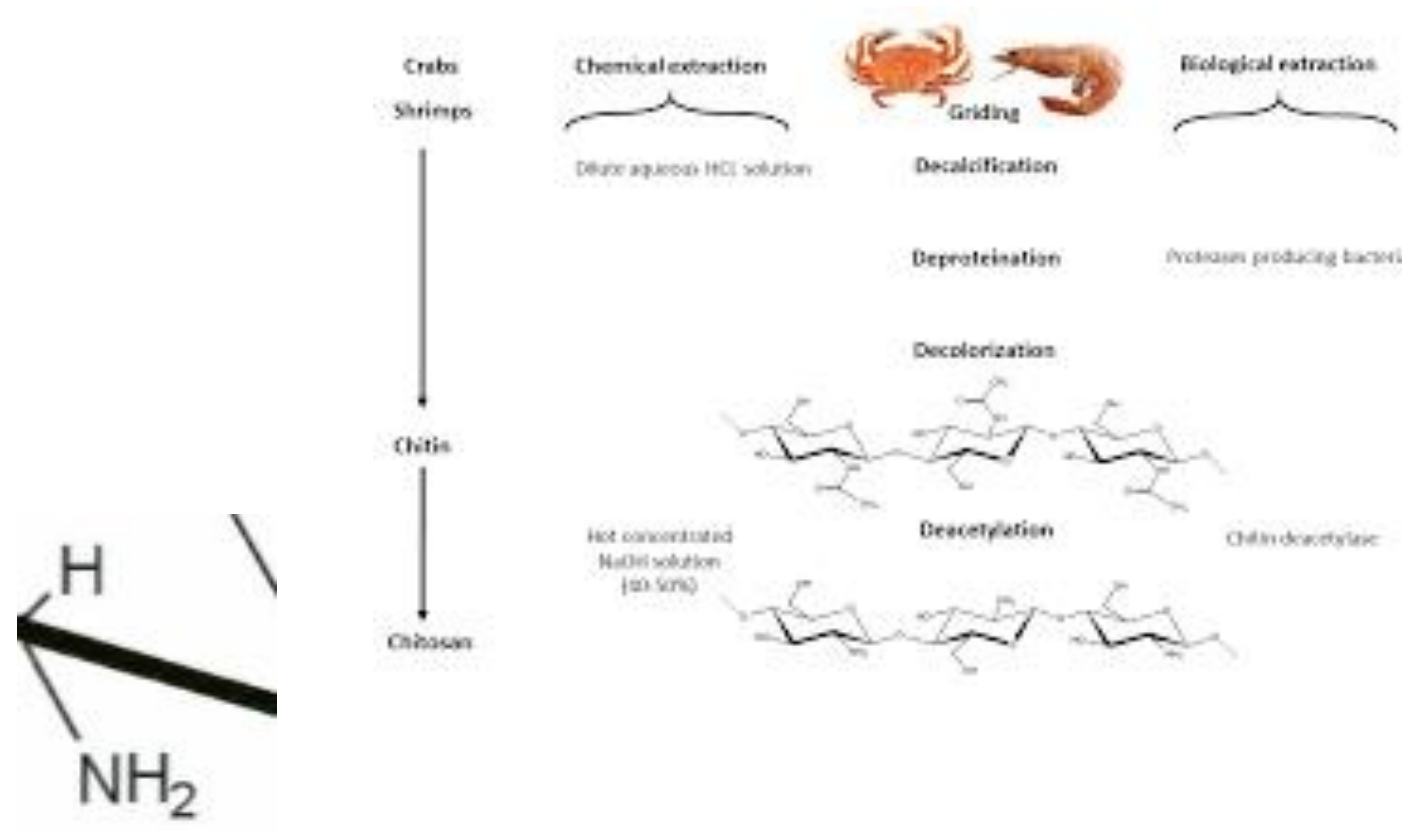
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ABSTRACT

Kaolinite clay disk which modified was synthesized by blending chitosan bio – polymer by using a facile and novel water assisted mechanochemical grinding and its efficiency in hardness removing was reported. The efficiency was tested with aEDTA titration. When comparing the hardness removal capacity between pure kaolinite and kaolinite modified with chitosan, latter one shows 09 times higher absorption capacity than ball milled. Thus, our kaolinite clay disk modified with chitosan was interpreted successful removal of hardness giving ions from water.

HYPOTHESIS

Chitosan which is one of the abundant bio – polymers in the nature. Especially chitosan can be extracted from fishes, of family crustacea. Importantly, chitosan is compared with -NH2 group which has a long pair that can act as a Lewis base. In that scenario, Ca2+ and Mg2+ ions can chelate with the long pairs of INH2 group and finally the removal of hardness giving ions in water is achieved.



Here's NH group and it has free spaces to attract roaming ions. And chitosan nontoxic polymer in nature

Hardness of water

Being an island in the Indian Ocean, Sri Lanka is blessed with many sources of water. Water found in most of the places in Sri Lanka is polluted due to the environmental pollution, urbanization, increase of the population, usage of fertilizers, pesticides and weedicides in agricultural activities causing Chronic Kidney Disease of unknown etiology and cancer to those who are drinking water. When surface water sources are polluted, the use of ground water will increase. A major consequence of ground water (especially in dry zones) is water hardness. The simplest definition of water hardness is the amount of dissolved calcium and magnesium in water. According to WHO (World Health Organization) guidelines, 00 – 60 ppm of calcium carbonate is normal water (drinking water) 60 – 120 mg/l concentration of calcium carbonate in water is moderately hard, 120 – 180 mg/l concentration is hard and more than 180 mg/l is very hard and it is called as the permanent hardness.

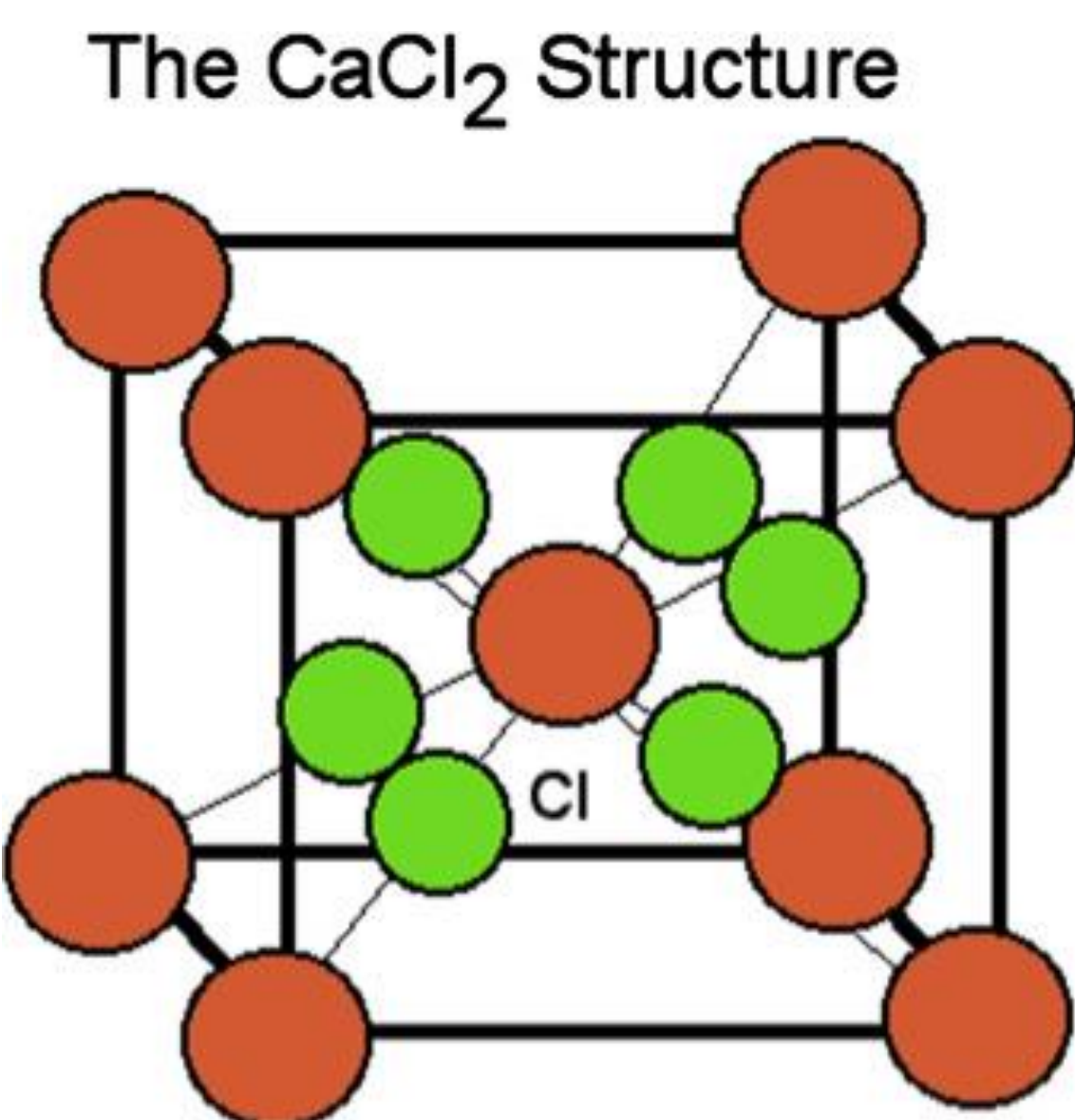


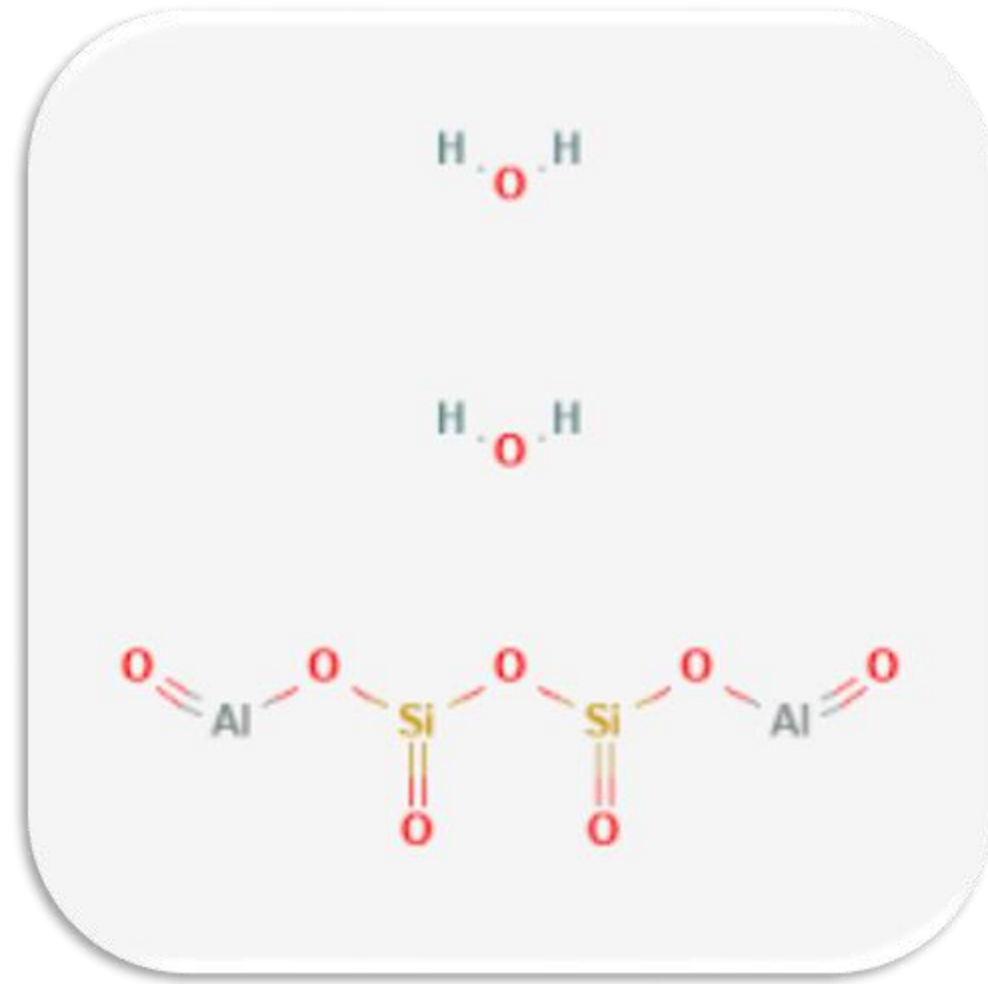
Figure 2. Crystal structure (cubic, Ia3d) of Calcium chloride (CaCl_2)

Kaolinite

Kaolinite is a clay mineral, part of the group of industrial minerals with the chemical composition $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$. It is a layered silicate mineral, with one tetrahedral sheet of silica (SiO) linked through oxygen atoms to one octahedral sheet of alumina (AlO) octahedral. Rocks that are rich in kaolinite are known as kaolin.



Figure 3 and 4 Kaolinite structure and used clay



Chitosan

Chitosan is a linear polysaccharide composed of randomly distributed β -(1→4)-linked D-glucosamine (deacetylate unit) and N-acetyl-D-glucosamine (acetylated unit). It is made by treating the chitin shells of shrimp and other crustaceans with an alkaline substance, like sodium hydroxide.

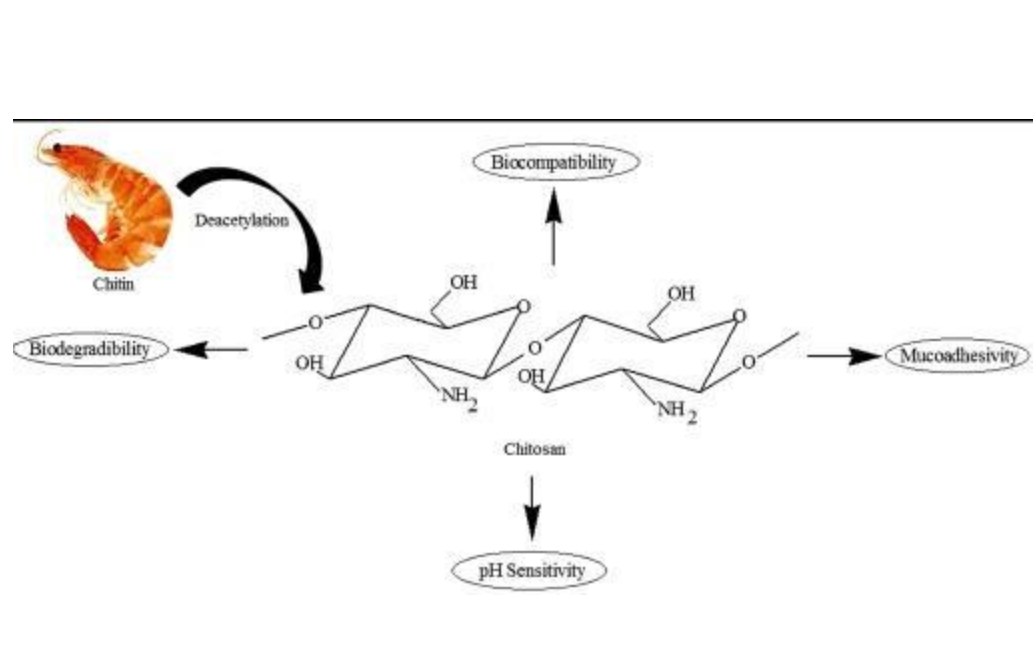


Figure6. Chitosan structure

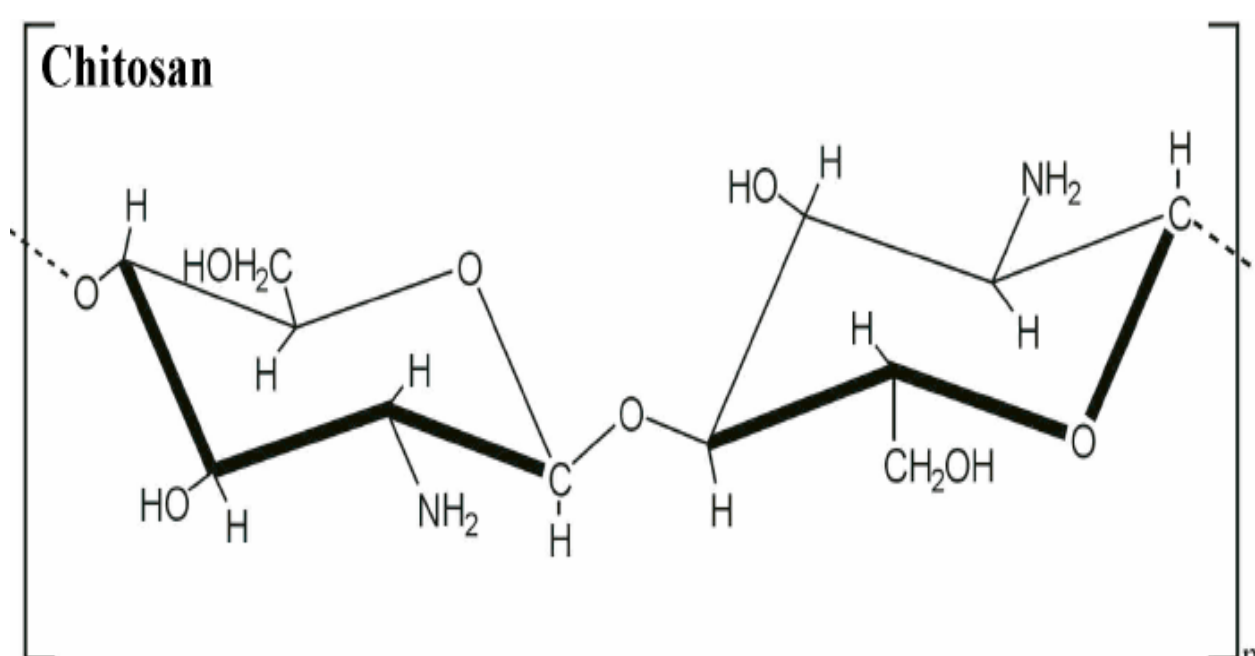


Figure5. Chitosan structure

MATERIALS AND METHODOLOGY



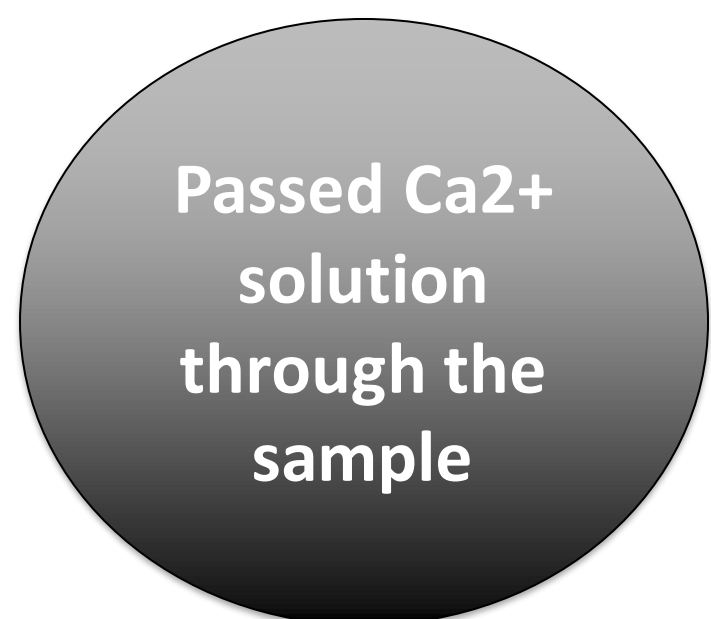
Figure5 Ball – milled clay sample



Figure6 Ball – milled clay sample



Chitosan sample



Passed Ca2+ solution through the sample



Figure 3. Clay samples

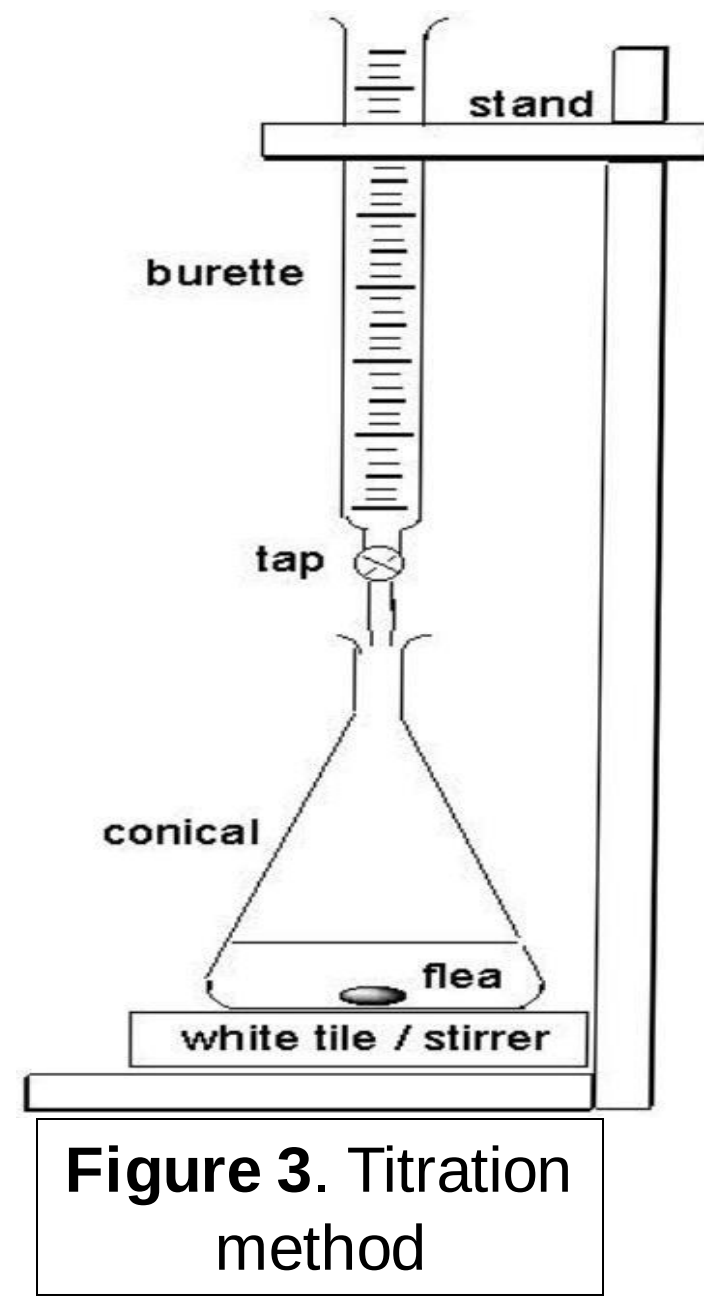


Figure 3. Titration method

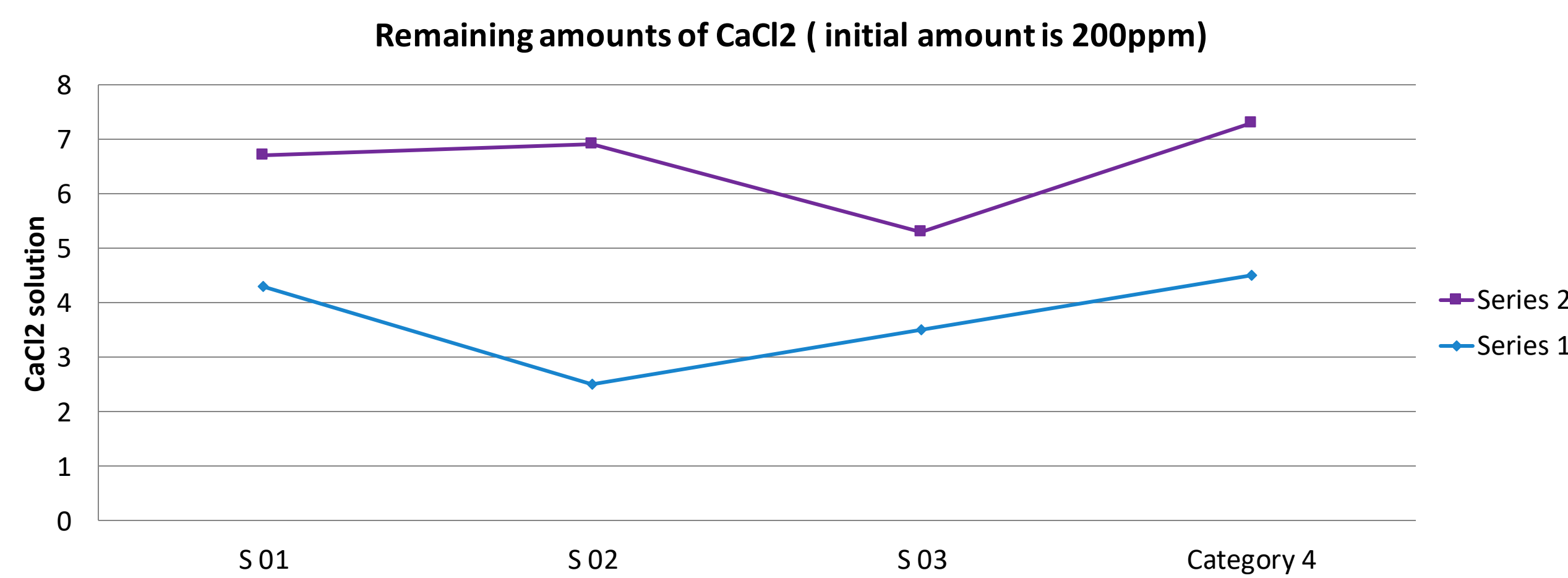
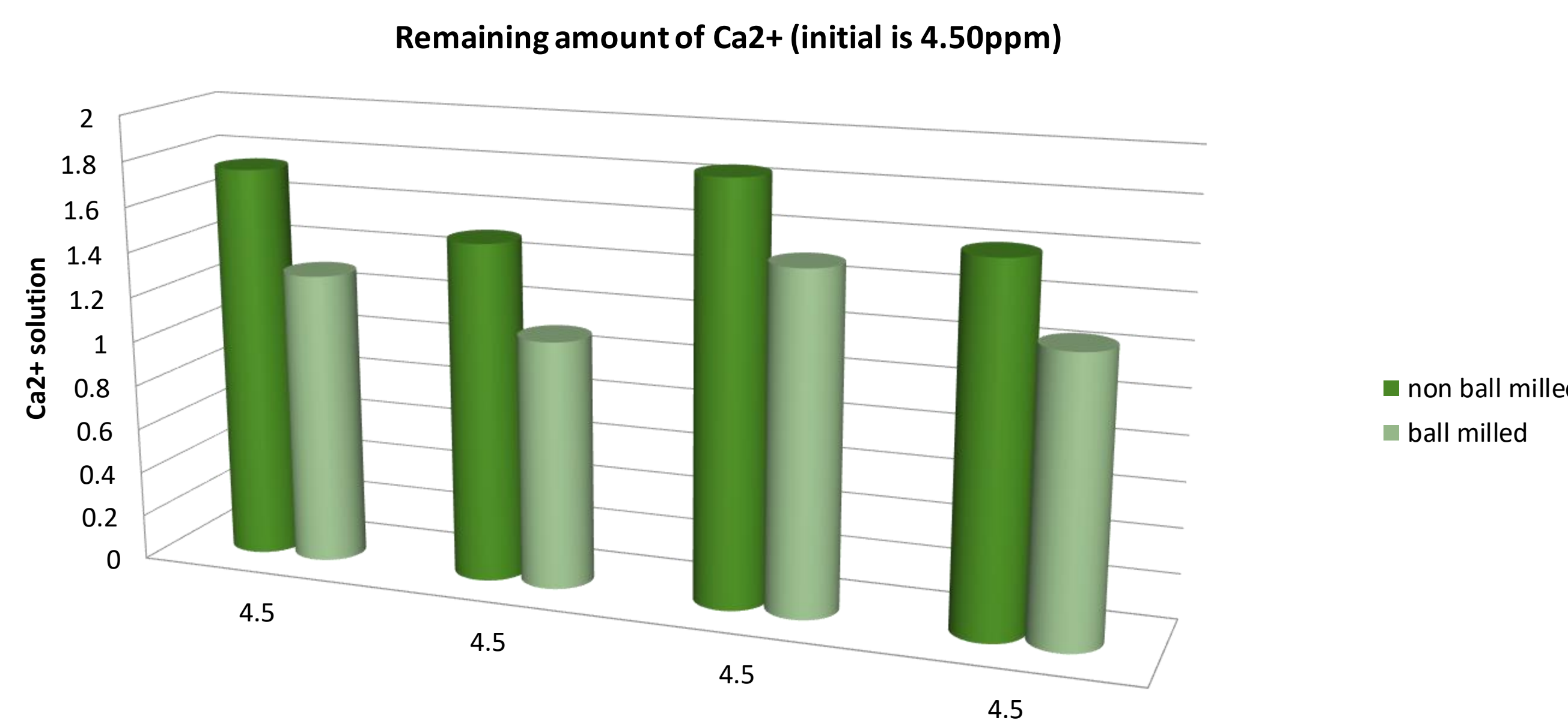
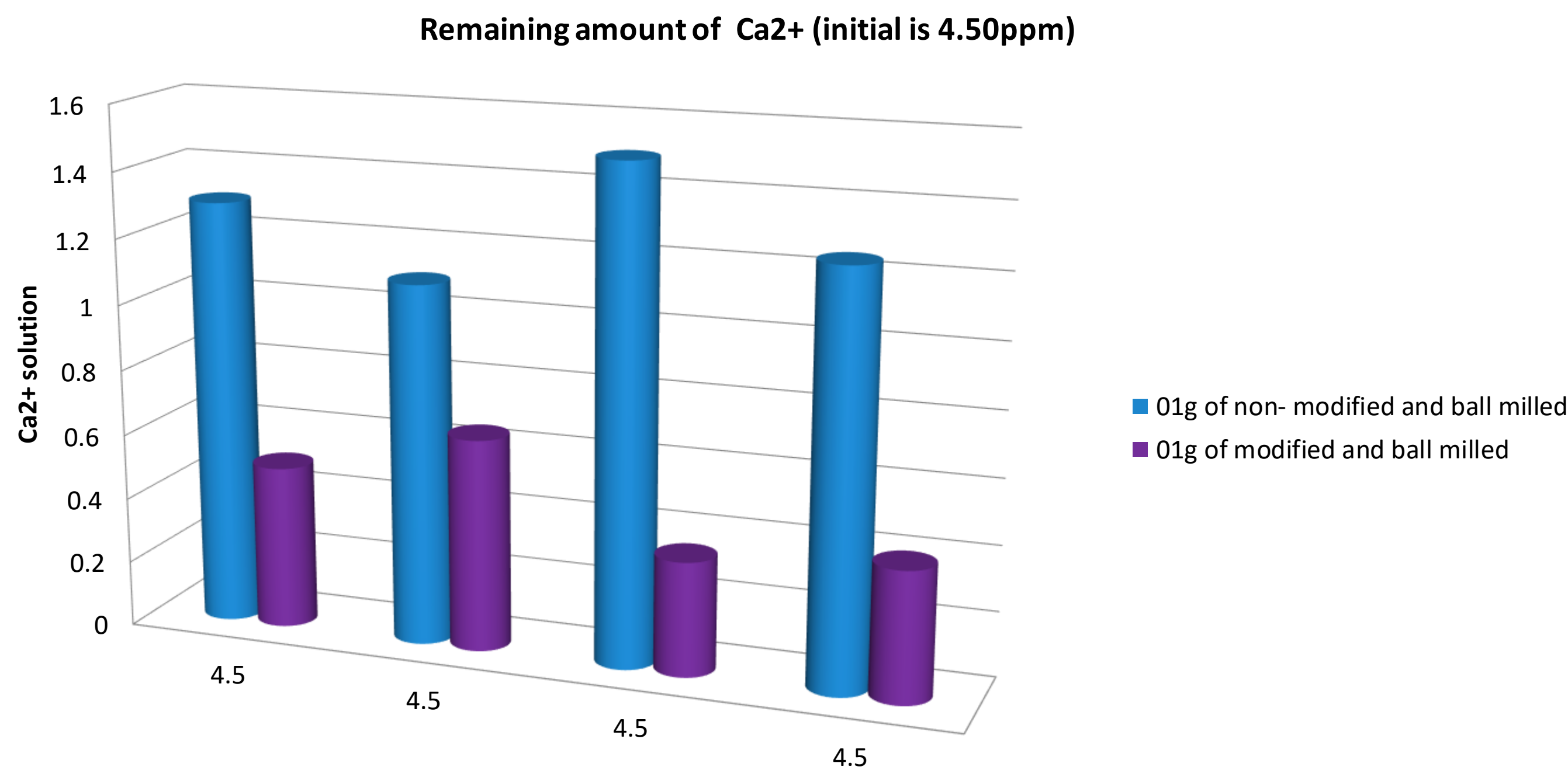


Figure 3. End point of the experiment



Final results Above 80%

RESULTS AND DISCUSSION



CONCLUSIONS

- As it has a good adsorption capacity we can use this nontoxic material to filter hardness of water
- According to the above results kaolinite modified with chitosan has a good removal percentage and it is above 96.83% .
- Because of that we can use this nano clay composite to remove permanent hardness from water.

ACKNOWLEDGEMENTS

- Mrs. D. P. U. D. Abeysekara (teacher in charge of the nalanda College science research society)
- Professor Nilwala Kottegoda (Department head, Department of chemistry, faculty of applied sciences, university of Sri Jayawardhenapura)
- Dr. Imalka Munaweera (senior Lecturer, Department of chemistry, faculty of applied sciences, university of Sri Jayawardhenapura)
- Chamalki Madhusa (DCFAUSJ – Lab G01)
- Sehan Jayasinghe (DCFAUSJ –Lab G01)