

DISCOVER THE MAGIC OF POLYMERS IN SOAPS & DETERGENTS !

ABOUT AUTHOR

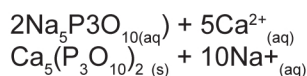
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STPP was first successful inorganic polymer ingredient which formed soluble complexes with hard water salts & it became main builder of laundry detergents. However in 1970 & onwards legislation came in many countries for limiting/stopping use of STPP on account of eutrophication/environmental issues. Limiting the STPP use in laundries on account of soaring prices started in countries where such legislations were not introduced. In India also dosage of this product has been

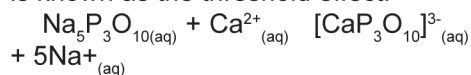
reduced primarily because of economic reasons.

It's very important to understand that STPP works on the principle of complexation with the hard water ions, primarily comprising of Ca, Mg ions. It forms a water soluble complex only if its concentration is in stoichiometric ratio or in excess with the hardness ions in the wash water. The moment it is reduced it forms an insoluble salt of dicalcium phosphate or dimagnesium phosphate. These salts have a tendency to precipitate from the wash waters and get deposited on fabrics/wares.

When low levels of sodium tripolyphosphate are used, insoluble calcium and magnesium salts of tripolyphosphate, e.g. $\text{Ca}_5(\text{P}_3\text{O}_{10})_2$, are formed which precipitate out.



At higher concentrations of sodium tripolyphosphate, a soluble 1:1 complex $[\text{CaP}_3\text{O}_{10}]^{3-}$ is formed. This effect it is known as the threshold effect.



It is therefore important that the concentration of STPP is sufficient to form the soluble complex rather than the insoluble salt. So at lower dosages, practically the importance of STPP is nullified. The dilemma for the formulator is if he increases the STPP dosages at the required levels the cost increases and if he incorporates less STPP its efficiency goes down considerably. In India & other developing countries many small & big detergent players use minimum possible of STPP then what is needed. Sodium Carbonate was first widely used economical substitute of STPP because it fulfils alkalinity & buffering requirements. However this had a major negative effect. Hard wa-

ter salts react with Sodium Carbonate & forms insoluble salts (Calcium carbonate, Magnesium carbonate by ion exchange) which precipitates on the clothes. The repeated washes results in graying & hardening of the clothes.

IS THERE A WAY OUT ?

New generation polymeric dispersants based on Acrylic, Acrylic/Maleic (low molecular weight and high molecular weight) would even at very low dosages disperse the insoluble phosphates and other salts as well, which would not let them deposit on the fabric/surfaces. These being polymeric in nature works at sub-stoichiometry levels (effective even at low dosages!). So a formulator can reduce its cost with added benefits of performance improvements. A recent development from **Rajasthan Detergent, ACR 4500** has a very broad distribution of molecular weights giving advantage of both low molecular and high molecular weight polymers.

Incorporation of polymer, does the following functions :

1.Reduces the Encrustation:-

The build up of Calcium Carbonate on clothes is called encrustation. Polymer affect the deposition of Calcium Carbonate by acting as crystal growth inhibitor & acts as dispersants. When soda ash based detergents are used, Soda Ash reacts with salts of hard water & forms insoluble complexes there by resulting in encrustation, which increases wash after wash. Polymers help inhibit the growth of insoluble complexes & keep them in suspended form so that they are easily washed away with rinse water. Sodium carbonate formulations with out polymer will have a very big problem of encrustation.

2. Soil Removal Increases:

Oily & particulate soil gets loosened when soiled fabrics are washed with detergents. Polymers adsorb on this loosened soil/dirt & keep them in dispersed form making it easily removable with rinse water. Further, surfaces of some synthetic fabrics are hydrophobic in nature. Wetting of such fabrics is difficult. Polymers modify the fabric surface & make it more hydrophilic & wettable which result in better soil removal/cleaning

3. Prevents Redeposition of Dirt :-

Polymers impart negative charge on the loosened soil, thereby they repel each other & remain suspended in the wash solution & are easily removed by rinse water & do not redeposit on the cleaned clothes/surfaces. CMC was conventionally used for its anti-redeposition role. With incorporation of these polymers CMC can be eliminated from the formulations.

4. Sequestration/Chelation:- The divalent cations present in the hard water have a preferential tendency to react with the primary anionic surfactants (primarily LABSA). Consequently, the surfactants are precipitated from the wash water reducing efficiency of the detergent drastically. Polymers have good chelating values and as such need for separate builders is eliminated from the formulations.

It is clear that, Polymers have become essential ingredients of laundry products. They perform multiple tasks of inhibiting growth of Calcium, Magnesium Carbonate Crystals, does Sequestration, Help Soil Removal, Prevent Redeposition of Dirt, Dispersing the insoluble clays, Prevent Encrustation on Clothes and improves the whiteness/brightness index of the cleaned cloth. Using just up to 1% or so of these we can eliminate/reduce STPP in the formulations to a great extent. Overall performance in all directions increases without adding cost.

5. Dispersant for Fillers Incorporated:-

Majority of the Indian Subcontinent detergent formulations incorporate high levels of fillers like China clay, Soap stone, Dolomite, Calcite etc. These are nothing but well defined particulate soils. Now, the irony is detergent formulations require removal of particulate soils but at the same time for lowering costs, these soils are incorporated in the formulations itself!. Since Polymers are the best dispersants (particularly low mol.wt), their incorporation becomes all the more important. These would disperse soils from the formulation which would easily remove through the rinsed wash water.

6. Dish Washing - Gives Spotless Cleanliness:-

Most of the dish washing formulations have one major deficiency. After washing, filming & spotting on utensils take place. Higher the hardness of water more prominent becomes the spotting. This results because of precipitation of hard water inorganic salts on the utensils/glass wares. Incorporation of polymer dish washing formulation inhibits the crystal growth of inorganic salts & keep them in suspended form so that they get easily rinsed away with wash water & we get spotless sparkling cleaned utensils with sheen.

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