



# Investigation of factors associated with the particle formation in selected soft drinks

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## ABSTRACT

This research study is based on the identification of the composition of sediments formed in some of the soft drinks manufactured by a leading beverage manufacturer of Sri Lanka, and the cause for such sediment formation. The research project was carried out in collaboration with the manufacturing organization concerned. The name of the manufacturer is not stated due to reasons of confidentiality. Two types of carbonated beverages were investigated which were labeled as Type I and Type II for the reasons of confidentiality.

Firstly, the investigations were carried out to identify the degree of solubility of sediments in different types of solvents and the results disclosed that the particles are acidic in nature.

The metal ion concentrations ( $\text{Fe}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ ) of particles in beverage Type I, materials and semi processed materials (treated water, carbonated water, sugar granules, sugar syrup before filtration, sugar syrup after filtration and flavoured syrup) used in the beverage manufacture and finished beverages of Type I and Type II were analyzed using the atomic absorption spectrometry. The metal ion composition of the sediments of beverage Type II could not be determined due to the insufficient quantity of the sediments isolated as a result of the limited samples provided by the manufacture.

Although the metal ion concentrations of magnesium, calcium and iron are significant in the finished beverage of Type I and the metal ion concentrations of magnesium and calcium are significant in materials and semi processed materials (treated water, carbonated water, sugar granules, sugar syrup before filtration, sugar syrup after filtration and flavoured syrup) used in soft drink manufacture, those values are less than the minimum detection limits of the respective metal ions and also a certain fraction of metal ions might have washed out during the clean up with deionized water and therefore a correlation between the analyzed metal ions and the particle formation was not possible.

The microbiological studies carried out on isolated particles of beverage Type I and Type II and on sugar syrups, did not disclose any relationship with the sediment formation.

The pH and turbidity measurements of samples collected at different points of the production line did not reveal sufficient information to identify the origin of the sediment formation.

The Infra Red spectroscopic analysis revealed that the sediments contained either benzoic acid or p-hydroxy benzoic acid and there is no contribution from the materials used during the manufacture such as filter bag and / or inner lining materials of the bottle closure which come into contact with the beverage during production or storage.

According to the microscopic observations the sediments isolated from beverage Type I mainly consisted of needle shaped crystals whereas that of Type II was an assortment of small irregular shaped crystals. Therefore, it may be possible that the sediments in beverages Type I and II to be chemically different from one another.

The GC-MS analysis carried out on sediments isolated from beverage Type I proves that the sediments mainly contain benzoic acid. The GC-MS analysis on sediments of beverage Type II was not possible due to insufficient quantity of isolated sediments.

The HPLC analysis carried out confirms the presence of sodium benzoate in the beverage Type I and the benzoic acid in the sediments of the same beverage bottle.