

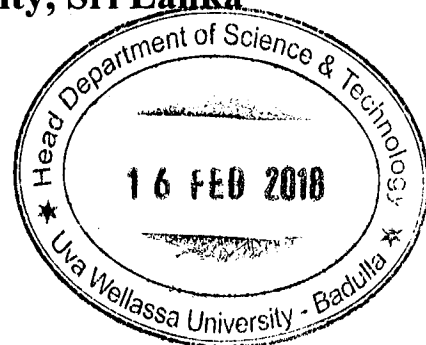
# **Development of a pH Responsive Ceramic Material**

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by

Mahanama Geeganagamage Chathuranga Mahanama

**Faculty of Science and Technology**  
**Uva Wellassa University, Sri Lanka**  
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## Abstract

Not only human been as well as all the animals consume food items daily. They cannot continue their lives without food items. Food spoilage is a big problem to the food industry. Because of the bacteria and other microorganisms acted in food items. This cannot be overcome but able to be controlled. In food industry the most difficult thing is to identify the food whether it is spoiled or not.

From this research that blank will be fulfilled. Because this research introduces a pH sensitive smart bottle cap. When the pH is going to change this pellet will be easily identified by giving a color change. When some food item is being spoiling, there will be produced lactic acid. Because of acidic condition pH will be reduced. That pH variation can be identified by pellet.

Kaolin is the ceramic material which is used in this research. Here it used kaolin because of non-toxicity & chemical inertness. Then kaolin material prepare for the condition which can absorb dye material as well as to obtain clear view of color change. This research used four types of dye materials. Two of them are consisted with anthocyanin and other two are commercial dyes. Anthocyanin can undergo molecular rearrangement due to polyphenolic group and extended conjugation of double bond depending of pH of medium. Also in methyl orange and methyl red, they show different colors in acidic and basic conditions. Other important thing is those dyes are low toxicity and may not be able to effect to the food item.

The main objectives of this research are checking the air stability of these dye, prepare the pH series of dyes and check whether how they react with the dyes, check whether the dye absorbed pellets are reacted with the acidic, basic conditions as well as spoiled and non spoiled milk and finally develop the bottle cap.

The air stability of those four dye materials have been checked by the UV visible spectrometer. For the red cabbage, there were increased of absorbance gained after 72hours. The pH reduction average is 34.04% after 72 hours. Same as the Hibiscus dye also shown, a increase of absorption and reduction average of pH 25.35% after one day. Same as methyl red dye, it shows 11.7% increase of absorption after one day. Also it shows 20.045% of pH reduction after one day. In methyl orange, it shows 67.67% of absorbance increase and 19.3% of pH reduction.

Red cabbage absorbed pellets show yellow color for the 1M sodium hydroxide and pink color for the 1M sulfuric acid. For the spoiled milk blue color pellet shifted to the purple as well. Same results were obtained for the Hibiscus dye. Methyl red shows yellow color for 1M NaOH & red color for 1M sulfuric acid. Also it shows brownish color for the spoiled milk as well. Methyl orange dye shows yellow color for the 1M NaOH and no color change obtained for the 1M sulfuric acid. Then it shows brown color with the spoiled milk as well.