

Toxicity of Lead (PB) and Mercury (HG) in Vermilion (Sindoor) in India and Comparison of old and New Process of Formation of Vermilion

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ABSTRACT

India is a very great country because there are so many religions and so many festivals of them. All the religions have same respects in here. One of the beautiful and very old religions is 'Hindudharma' in here. It is a biggest religion in here. Maximum populations follow this religion in India. 'Sindoor' is an important part of this religion. Actually Sindoor is a red colour which is used in festival, worship of god, and married woman uses as a sign of marriage. This colour is used in here because red colour is a symbol of energy and long life in this religion. Modern sindoor mainly uses vermilion, which is an orange-red pigment. Vermilion is the purified and powdered form of cinnabar, which is the chief form in which mercury sulfide naturally occurs. As with other compounds of mercury, sindoor is toxic and must be handled carefully. Sometimes, red lead (lead tetroxide, also known as minium) is added to sindoor. Red lead is toxic and a known carcinogen for laboratory animals, though its carcinogenicity to humans has not been established. Traditional sindoor was made with turmeric and alum or lime, or from other herbal ingredients. Unlike red lead and vermilion, these are not poisonous. In early 2008, allegations of high lead content led the U.S. Food and Drug Administration to recall batches of sindoor from several manufacturers.

Key words:- Sindoor (vermilion), Gravimetric analysis;

I INTRODUCTION

As you know that day by day pollution is becoming a biggest problem for us. We should control it. For this we will have to watch our all useful products. One of the most respected pigment is sindoor which is a part of life. And its chemical name is vermilion. There are so many cases of vermilion in which different type of skin diseases. Like leucoderma disease has been a biggest problem for woman who uses sindoor regularly. India have different type of people who are in different financial condition. Maximum lower level people uses very cheap sindoor. This sindoor has large amount of lead and other toxic chemical. Sometime Rhodamine dye is also used for making more attractive product which can give very harmful effect. At a time it has become a general trend to avoid using of sindoor at any occasion. And so many Hindu married women don't use sindoor. Because all they know about toxicity of sindoor. Following chemical compounds have been used in sindoor

Pb₃O₄(Red oxide of lead), HgS(Mercury sulfide)

(a) **Old method:-** For the formation of sindoor in previous time Turmeric and calcium hydroxide used to be used. Both are available in market mixed together. Both the amount should be equal. A little water is added just enough to make a paste of it turned a bright ketchup red colour. Then made small ball of this paste. Left to dry out completely crushed the balls and you can use to find a perfect red powder that is much safer than commercial sindoor. Sandal wood, lemon saffron are also used in previous time for making sindoor. It was an oldest method of sindoor and there is no Lead and cinnabar in this process.

(b) **New method:-** In new method of sindoor cinnabar and red lead are the main chemicals used to make sindoor are: Vermilion-HgS (Mercury (II) Sulfide) and Some Times Red Lead (Pb₃O₄) is also to add Rhodamine dye is used for making more attractive product. It is a very toxic for skin but in our India nobody is aware about toxicity of them. There is no expiry date of sindoor. It is a general trend only medicine expiry date is seen.

(i) **Side Effect of Lead Oxide** Lead rank 36th element in order of abundance in the Earth's crust and its concentration in the Earth's crust has been estimated at 12.5 ppm. In the recent year lead toxicity has emerged as an important global problem for public health consequences, particularly in children, due to its serious impact on brain function. There is in fact an urgent need for developing countries to generate data on the nature and extent of the problem so that appropriate steps can be taken to prevent lead toxicity. In this communication, we highlight certain important facets of lead toxicity. Lead levels up to 150 ppm have been reported in soil forming rocks. The usual range of lead concentration in soils has been estimated at 2 to 200 ppm. The problem of lead poisoning is quite serious in India about 53.5% of children below the age of 12 years have their blood lead levels about 10 µg/dl which is the WHO's permissible limit for blood lead level. High blood lead level means that such children can lower IQ⁽¹⁴⁾

The important sources of lead exposure include gasoline additives, food can solder, lead based paints, ceramic glazes, drinking water system, cosmetics and folk remedies, and battery/plastic recycling industry. In India, the main source of lead pollution is through automobile exhaust because of the use of unleaded gasoline. In developed countries like UK, the Royal Commission on environmental pollutants has banned the use of leaded gasoline. In India, first National Emission standards for lead and other pollutants were issued in February 1990 through an Extraordinary Gazette of India. These standards were revised and promulgated in April 1996 and will be applicable till 2000-2001. However, these recommended permissible limits of lead (0.56 g/l) are still very high than the levels (0.013 g/l) in developed countries such as USA, UK and Germany^[6].

Lead toxicity is termed as "plumbism" or "saturism". It is known to cause acute, chronic and sub-clinical toxicity.

(ii) **Side Effect of Cinnabar:** -Cinnabar, mercury sulfide, is the most toxic mineral to handle on Earth. The name itself means dragons blood. Cinnabar is the main ore of mercury. Forming near volcanos and sulfur deposits, the bright red crystals signal danger. Cinnabar may release pure mercury if disturbed or heated, causing tremors, loss of sensation and death

Cinnabar (mercurysulfide) the chief mineral of mercury .which is used in sindoor Mercury in excess of 25 mg may be caused various diseases the symptoms due to mercury poisoning are tingling of fingers and lips. Restlessness, intolerance irritability, nervousness, constipation, loss of memory, weakness tremors, loss of teeth, and brain damage etc. mercury

dose of about 200mg may even cause death. Mercury is the most toxic metal among all the commonly occurring metal pollutants. The world's first major of metal pollution well known as MINAMATA EPISODE, also involved Mercury is widely distributed in the environment, although in concentrations lower than other common heavy metals. The earth's crust contains 0.08 ppm of mercury, which is several times lower than the concentrations of vanadium, chromium, nickel, zinc copper, cobalt, lead and cadmium in sandstone and soil, haes and limestone mercury occurs at leaves averaging 0.03ppm 0.5ppm and 0.056 ppm respectively,

Mercury is widely used in industries which produce electrical equipment, paints, pesticides pulp and paper domestic thermometers, medicines, batteries, dental amalgams, cosmetic product, sindoor etc. these are contributed significant amount of mercury to the environment.

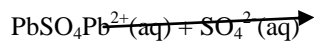
(iii) **Experiment:** -Some samples of sindoor were collected from market. One was very cheap second was normal and third was costly and forth one was prepared by me by old method in lab. I found that lead contain of that samples were different Gravimetric analysis was used for finding lead contain of that samples. 2gm of sindoor sample dissolve in 20 ml DM water added Con. H₂SO₄ till that white precipitation is formed 1 to 2 ml of HCl is added warmed it and then cooled it and filtered with the help of glass crucible washed with DM water after that dry it and then weight it repeat four times its weight after dry till than a constant weight. After that calculated weight of lead contain.

II CALCULATION

	Homemade sindoor	Purchased sindoor {very cheap }	Purchased sindoor {normal rate }	Purchased sindoor {costly }
Volume of sindoor solution	50.0ml	50.0ml	50.0ml	50.0ml
Mass of glass crucible	24.0730gm	24.0730gm	24.0730gm	24.0730gm
Mass of glass crucible and precipitate after first heating	24.2930gm	24.4836gm	24.4820gm	24.4715gm
Mass of glass crucible and precipitate after second heating	24.2735gm	24.4052gm	24.4019gm	24.3815gm
Mass of glass crucible and precipitate after third heating	24.2730gm	24.4048gm	24.4015gm	24.3810gm

Mass of glass crucible and precipitate after fourth heating	24.2730gm	24.4048gm	24.4015gm	24.3810gm
Net Wight	24.2730gm	24.4048gm	24.4015gm	24.3810gm
Mass of precipitate	0.2000	0.3318gm	0.3285gm	0.3080gm

Mass of precipitate= mass of (glass crucible+PbSO₄)-mas of glass crucible
 Weight of SO₄²⁻ = Weight of PbSO₄×gravimetric factor
 =Weight of PbSO₄×a (gram formula weight of SO₄²⁻)/b (gram formula weight of PbSO₄)



Thus a=1 and b=2

Hence weight of SO₄²⁻ =Mass of precipitate × [32.066+4(16)]/[207.2+32.066+4 (16)]

Weight of SO₄²⁻=Mass of precipitate ×96.066/303.266

=Mass of precipitate ×0.3167

Mg/L SO₄²⁻ = Mass of precipitate ×316.7/ml sample

=Mass of precipitate ×10⁻³×316.7/50×10⁻³

= mg/l

III RESULT

Calcium contain in homemade sindoor = 2.8000mg/l

Lead contain in Chief rate sindoor =2.1016mg/l

Lead contain in normal rate sindoor =2.0807mg/l

Lead contain in costly sindoor =1.9508mg/l

After gravimetric analysis in homemade sindoor calcium sulfate (m.p. 1460 °C) is formed which has low density 2.96g/cm³ and in other samples lead sulfate(m.p. 1087°C) is formed which has high density 6.29g/cm³. It can be observed in aqueous solution. These data is like mirror for us to indicate lead contain of sindoor.

IV CONCLUSION

This is identified Sindoor has a high potential of lead exposure in India. Among Indians whose sindoor regularly are in high-risk population. With the help of this data it is very clear that in sindoor lead contain is very high and so many people have been affected after using of it. It is a big drawback of our India there is no any strict rules for selling of this type of toxic material and we are not aware to selection of this. One more point which is economical gap of our India is very high. Maximum people of our India are very poor. They are use all things in worst quality. I think it is all people's duty to maintain the quality of all products and don't use any toxic chemical in it.

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