

Case Report

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Gold Crime by Magic Solution – A Case Report



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Abstract

Gold is one of the precious metals and different kinds of jewellery are made out of it. Generally women are users of jewellery to pay attention to their appearance. Jewellery is also a traditional store wealth for Indian families. The regular uses of jewellery by individuals require being cleaned/polished for gleaming as good as new. In the cleaning process unscrupulous polishers alleged to remove few milligrams of gold and cheat the customers. In one case, two persons visited the house of the complainant and claimed to be goldsmith having expertise on polishing gold/silver jewellery. Accordingly, on good faith some gold/silver jewellery was handed over to them for polishing. On observation of polished jewellery, loss was not perceptible to eye but suspected weight loss after receiving back the same. Thereafter complaint was lodged and during investigation the police seized some powder and solution used for polishing from the accused and sent for forensic examination to detect gold in the magic solution. The details have been discussed in this paper.

Keywords: Jewellery, Polishing, Extraction, Magic solution (aqua regia), Chemical analysis ICP-OES (Inductively Coupled Plasma- Optical Emission Spectrometry)

Introduction

Among various precious metals gold is the most noteworthy. It is used in the form of jewellery, coin, art work and watches [1,2]. Gold jewellery has fascination among the common people worldwide for thousands of years. India is the world's second largest consumer of the metal and two thirds of India's gold demand comes from rural areas where jewellery is a traditional store of wealth [3]. As per available record, crimes like theft, cheating even murder are committed for gain of such costly metal. The stealing of gold from jewellery by way of polishing is often reported. In such cases, the ornaments are initially cleaned and thereafter dipped in magic solution Aqua Regia (a mixture of hydrochloric acid and nitric acid 3:1) which can dissolve noble metal like gold within few minutes. Thus the gold is polished and a thin layer of gold is shaved off during the process. The polishers explore various methods for stealing gold [4,5]:

- Stealing gold/silver from jewellery with chemical (aqua regia)
- Making jewellery having low carat mixed with other metals(alloy)
- Electroplating silver jewellery with gold and selling at high price

- Exchange of jewellery with fake one by magic tricks in the process of polishing
- Metal scraps of brass looking like yellow metal gold are sold to cheat customer
- Making jewellery mixing iridium (powder gold) for weight gain to fool the buyers

In this paper the cleaning solution (aqua regia) received from investigating agency has been examined by chemical tests, chromatographic and supported by instrumental analysis namely ICP- OES (Inductively Coupled Plasma- Optical Emission Spectrometry) Parkin-Elmer 7000 DV system to detect presence of gold in it.

Case Report

In one case, two persons approached the house owner in a semi-urban area and claimed themselves to be goldsmith, having expertise in gold & silver cleaning/polishing. They also convinced to make their jewellery look as good as new. Accordingly on good faith the house wife handed over two pair of silver anklets and gold chain to the goldsmith for polishing. The polisher handed over the same after polishing with powder

and subsequently washing with a solution. The jewellery had a gleaming look. Initially the complainant could not perceive the loss on viewing by naked eye but could suspect the weight loss of jewellery on receipt. Subsequently complaint was lodged and the police seized some reddish brown coloured powder and liquid substance from accused and sent for forensic examination to establish the crime.

Materials and Method

The following materials were received for examination:

- I. Gold chain (Figure 1),



Figure 1: Polished gold chain.

- II. Silver anklets (Figure 2),



Figure 2: Polished silver anklets.

- III. Some brown coloured powder (Figure 3),



Figure 3: Brown powder used for rubbing before dipping in solution.

- IV. Glass beaker containing solution used for polishing (Figure 4).

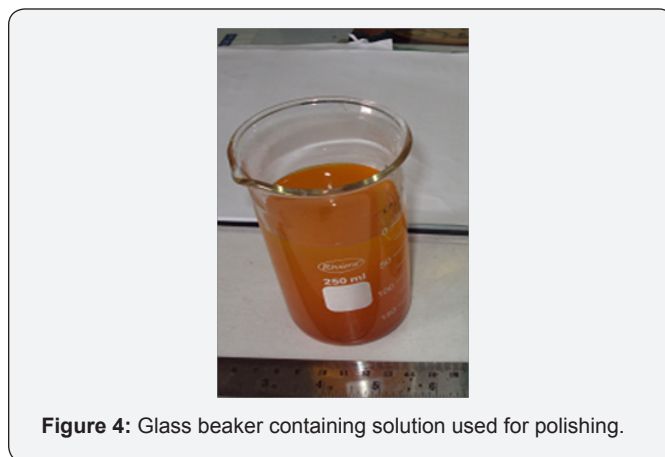


Figure 4: Glass beaker containing solution used for polishing.

The jewellery (I) and (II) examined to be made of gold and silver by Karatmeter [6]. The brown coloured powder analysed to be mixture of turmeric and ammonium chloride having alkaline character, commonly used for cleaning costly metal. The liquid containing in the glass beaker was highly acidic (pH 1-2) showing the test of NO₃⁺ and Cl⁻ ion and further test could confirm to be aqua regia used for dissolving gold. Accordingly the solution was exposed for chemical test and instrumental study like ICP-OES to ascertain the presence of gold and silver in the solution.

Results and Discussions

Table 1: ICP-OES result.

ID: Tripura SFSL Exbt-B			Seq No: 1				A/S Pos:	
Sample quality:	g:	Prep. Vol :	Dilution:				Date: 2017/06/23 16:50:42	
Analyte	Corr. Intensity	Conc (Calib)	Std. Dev.	Calibs Units	ConC (Sample)	Std. Dev	Sample units	RSD
Ag 328.068	94,364.4	0.118		mg/L	0.118		mg/L	%
Cu 327.393	152,414.6	0.272		mg/L	0.272		mg/L	%
Au 267.595	739,651.3	6.252		mg/L	6.252		mg/L	%
Ni 231.604	-56.8	0.000		mg/L	0.000		mg/L	%
Sn 189.927	-63.6	-0.079		mg/L	-0.079		mg/L	%

The result of chemical test coupled with chromatographic study could establish the identity of different seized items received for forensic examination. Further instrumental study conducted by ICP-OES shows conclusive results indicating presence of gold and silver in the magic solution used for polishing the jewellery. The reddish colour of aqua regia is developed due to use of turmeric powder for cleaning the jewellery and subsequently dipping in it. The results of the instrumental study show that the goldsmith attempted to extract more gold from necklace in comparison to silver jewellery (Table 1).

Conclusion

The jewellery polished was made of gold and silver. The allegation of stealing gold/silver from jewellery by way of

rubbing with powder and dipping in solution (aqua regia) was established by chemical and high-tech instrumental methods. The chemistry of powder, solution and their uses have been identified and discussed.

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