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The Minting of Platinum Roubles

PART III: THE PLATINUM ROUBLES OF JOHNSON MATTHEY

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It is not known for certain how four platinum roubles came to be in Johnson Matthey's possession. There is rumour that, at the end of World War I, A. B. Coussmaker of Johnson Matthey, negotiated with the White Russians to smuggle out of Russia a hoard of coins which had been withdrawn by the government years before. The hoard was reputed to be on a train to the West when the Reds caught up with it. Rather than stop the transaction, they thought it a good idea as it would raise capital for them – at that time, the refining capacity of the young U.S.S.R. had been disrupted. So they took over the deal and let the consignment continue its journey to Johnson Matthey where it was refined and the platinum sold on their behalf. However, this is speculation (1). Eye witnesses state that two roubles were definitely in the company's possession in 1956, and that two more came from the desk of Dr Leslie B. Hunt, the founder of this Journal (1). The roubles have thus been in Johnson Matthey's possession for almost 50 years and probably for longer. More likely to be true is a brief note in a typewritten statement in the possession of Johnson Matthey, stating no more than "the specimens formed part of a consignment sent to Johnson Matthey for refining about 1870" (2). As there is always interest in platinum coins and particularly in Russian roubles which were the first platinum coins to be minted, it was decided to investigate the metal content of the Johnson Matthey roubles to find if they conformed to recognised Russian roubles – or were forgeries.

The Innovation Group based at the Johnson Matthey Technology Centre was approached to examine and characterise four Russian platinum roubles belonging to Johnson Matthey. The coins are:

1828	3 rouble	1830	6 rouble
1834	3 rouble	1835	3 rouble

Forged Russian roubles have been identified as being of pure platinum metal, while the genuine coins contain iron impurities of up to 4 wt.% (3, 4). The coins were analysed by four methods:

[i] Magnetic, namely permeameter measurements,

[ii] Density measurements, see Table I

[iii] Scanning electron microscopy (SEM), see Table II, and

[iv] X-ray diffraction (XRD), see Table III.

In measuring the magnetic characteristics of the coins, a rare earth-transition metal type magnet

Table I

Densities of the Roubles (Measured in Ethanol) at Room Temperature

Year	1828	1830	1834	1835
Mass in air, g	10.3549	20.7039	10.1612	10.3120
Mass + wire in liquid, g	10.3727	20.3061	10.1845	10.3136
Mass of wire in liquid, g	0.4017	0.4017	0.4017	0.4017
Real mass in liquid, g	9.9710	19.9044	9.7828	9.9119
Difference, g	0.3839	0.7995	0.3784	0.4001
Volume, cm^3	0.4868	1.0138	0.4798	0.5074
Density, g cm^{-3}	21.27084	20.42163	21.17633	20.32503

Density of ethanol 0.7886 g cm^{-3}



Platinum 3 rouble coin dated 1828



Platinum 6 rouble coin dated 1830

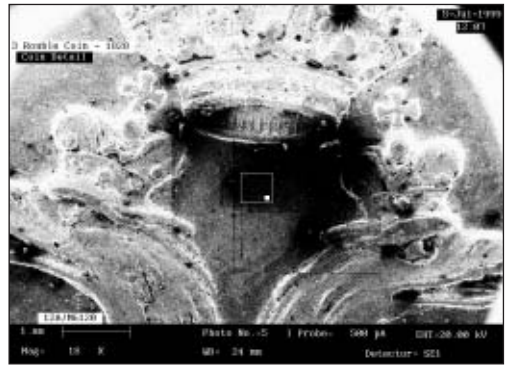


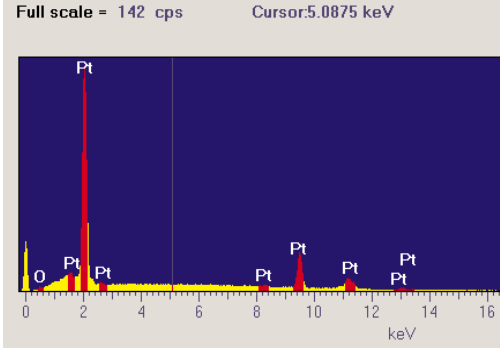
Platinum 3 rouble coin dated 1834

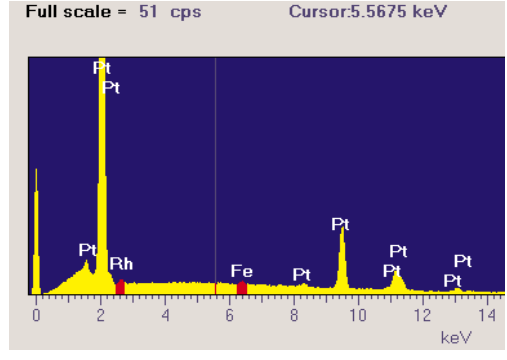


Platinum 3 rouble coin dated 1835

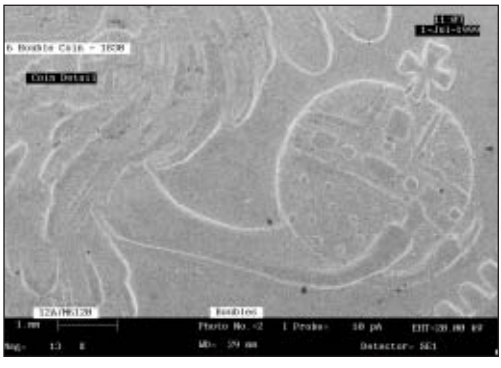




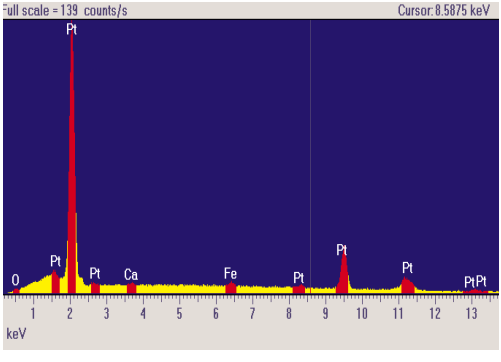


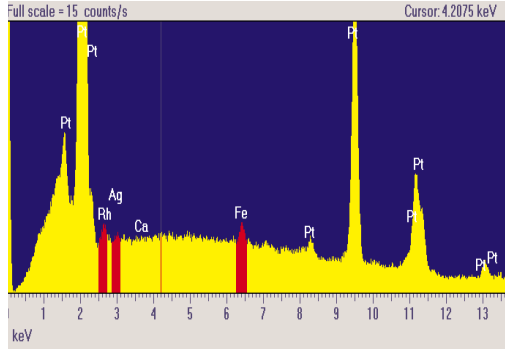


Micrographs and EDX spectra of the 3 rouble coin dated 1828; EDX: left 142 counts/s; right 51 counts/s

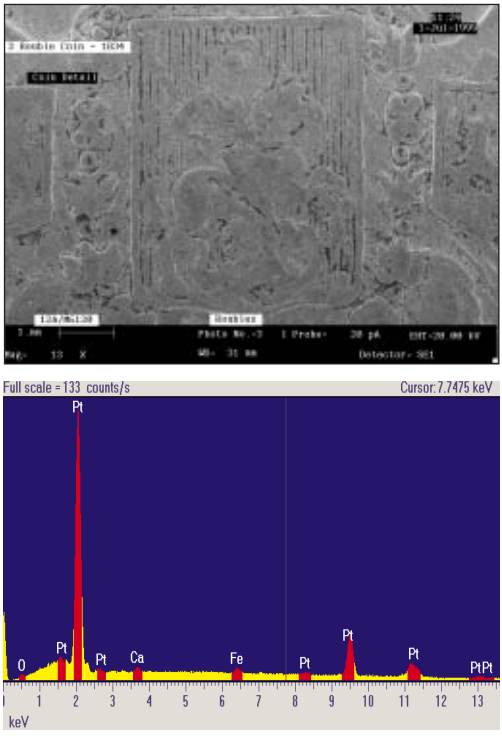




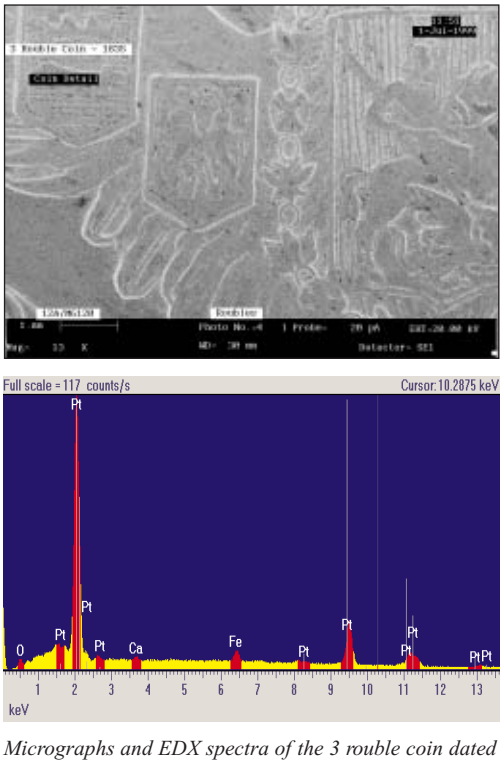




Micrographs and EDX spectra of the 6 rouble coin dated 1830; EDX: left 139 counts/s; right 15 counts/s



Micrographs and EDX spectra of the 3 rouble coin dated 1834; EDX: left 133 counts/s; right 15 counts/s



Micrographs and EDX spectra of the 3 rouble coin dated 1835; EDX: left 117 counts/s; right 37 counts/s

Table II

Elemental Analysis of the Roubles

Year	Coin	Iron, %	Platinum, %
1828	3 rouble	Trace	100
1830	6 rouble	1.6	98.4
1834	3 rouble	0.7	99.3
1835	3 rouble	4.8	95.2

was used a reference. However, the remanences and coercivities of the coins were too small for detection.

Density measurements were carried out (Table I), with the coins suspended by wire in ethanol. The theoretical density of pure platinum is 21.45 g cm^{-3}, and any substantial decrease from this value would indicate the presence of other foreign elements, that is, a genuine coin. The 1830 and 1835 coins were observed to have lower densities than the other two. From this measurement, and within experimental error, the Johnson Matthey archive thus appears to hold two genuine and two forged coins.

SEM was performed on the materials, using energy dispersive X-rays (EDX) to identify the elements present (Table II). Trace amounts of iron were found in three of the coins. The 1828 coin appeared to be ~ 100% pure platinum.

Finally, XRD was performed on the 1834 and 1835 coins to find if the 1834 coin was pure platinum. The two coins were both indexed to pure platinum. It was observed that the 1834 coin has an exact match to these parameters, while the 1835 coin has a definite shift towards a platinum/iron phase that is indexed. It is likely that the 1834 coin is in fact pure platinum and thus a forgery. Table III details the lattice parameters and crystallite sizes of the coins. Pure platinum has a lattice parameter of 0.3925 nm which is very close to the value obtained for the 1834 coin. The 1835 coin has a slightly lower value, indicating unit cell volume depression caused by the iron.

Conclusions

From these measurements we conclude that the 1828 coin is a forged rouble. It is more than likely that the 1834 is also a forgery as its platinum content is too high. The 1830 and 1835 coins are genuine roubles as they contain other elements, most notably iron.

Table III

Lattice Parameters and Crystallite Sizes of the 3 Rouble Coins

Year	Crystallite size, nm	Lattice parameters, nm
1834	34.29	0.392
1835	32.29	0.391

Acknowledgements

We would like to thank Alan Stubbs for the SEM work and Hoi Wong for the XRD analysis.

References

1 A. Austin, private E-mail communication, 28th July, 1999

2 Johnson Matthey, London, internal manuscript

3 C. J. Raub, *Platinum Metals Rev.*, 2004, **48**, (2), 66; and references therein

4 D. F. Lupton, *op. cit.*, (Ref. 3), 72; and references therein

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Allin Pratt is a Principal Scientist within the Johnson Matthey Innovation Group. His main interests are the application of metallurgy and materials science to new areas of research as well as conventional applications in materials, catalysis, biomedical applications, and renewable energy systems including batteries and hydrogen storage.

David Willey specialised in the interactions of materials and hydrogen with respect to battery materials, diffusion systems and metallurgical processes while at the Johnson Matthey Technology Centre. He also had experience in fuel cell technology. David is currently a consultant at Buchanan Communications, London, and is involved in strategic financial communications for a range of companies including Renewable Energy, E & P and Chemicals.

Production of Fine Iridium Fibre

In the last issue, K. Mori of Tanaka Kikinzoku Kogyo KK described the production of flocculate platinum fibre and non-woven fabric, which are used as electrically conductive fillers for porcelain enamel (*Platinum Metals Rev.*, 2004, **48**, (2), 56). Now, Furuya Kinzoku KK of Japan have produced fine iridium (Ir) and Ir oxide fibre from linear Ir compounds with Ir–Ir bonds as the main chains in a fibre-like shape (*Japanese Appl.* 2004-027,399). The Ir compounds are thermally treated either in H_2 or O_2, to form fine Ir or Ir oxide microfilament, respectively. The fibre size is 0.1–5 μm by ≤ 20 μm, with surface area > 1 m^2 g^{-1}. The Ir fibre displays a high melting point, chemical stability, and has excellent characteristics as a catalyst.

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