

## Geoforensic Passport of Mined Gold

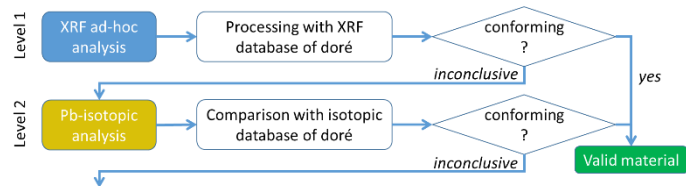
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Responsible sourcing programmes for precious metals have developed massively over the last decade, emanating from associations like LBMA, from private and public organisations (RJC, BGI...) as well as from many refiners themselves. All those initiatives have one fundamental flaw: they rely on compliance, audits, local government, in an environment that is not corruption-free.



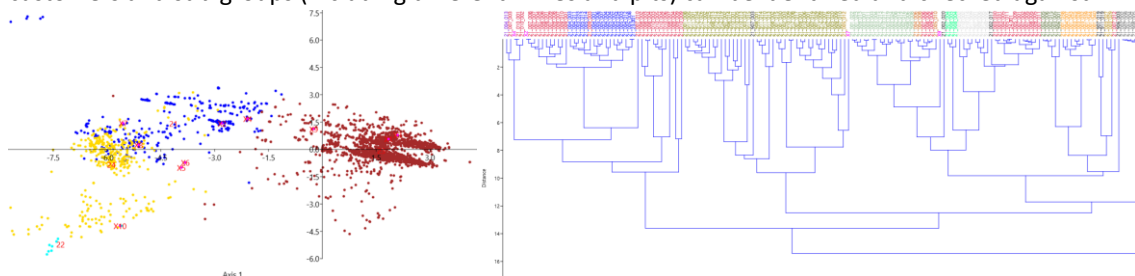
This paper presents a brand new scientific approach, which **allows validating the origin of doré received at refineries**.

- Level 1 – Doré are analysed at reception by ED-XRF (specially calibrated program); processing with database confirms identity of typically >90% of the materials;
- Level 2 – Pb-isotopic signature of samples is validated by comparison with another database; this usually allows validation of more shipments;

Combined, those databases are creating a **geoforensic passport for every mined gold source**. Those databases are dynamically updated at the refinery – every sample measured is added to the databases once validated.

The level 1 analyse is performed quickly with readily available equipment (ED-XRF calibrated with ad-hoc standard), measuring on doré materials 20 elements of interest (major, minor and impurities). Metalor Technologies has created a database from more than 8'000 analyses covering around 50 customers.

Using two standard tools – LDA (linear discriminant analysis) & hierarchical clustering – countries of origin, customers and sub-groups (including different mines and pits) can be identified and checked against.



This approach was tested on 100 samples received from South America. 98 samples were correctly assigned to the country and mine of origin. Only 1 result was inconclusive and escalated to Level 2 analysis. The last sample was coming from Africa and willingly mislabeled for the study. Although the composition was extremely similar to that of the South America mine it was assigned to, it was immediately detected as a problem by the system.

Geoforensic passports will be routinely used at Metalor Technologies to scientifically confirm the origin of the doré received at our refinery.

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