

Non-invasive on-site analysis of enamelled pottery, glass and metal artefacts.

Philippe Colomban

Nanomaterials de l'UMR 8233 MORARIS, UPMC Paris 6, CNRS, Paris, France

For more than a decade, the strong miniaturisation of electromagnetic sources and detectors led to the availability of different portable instruments, namely Raman microspectrometer[1-3], X-ray Fluorescence handheld analyzer [4] and UV-visible spectrometer [5]. These instruments inform on the phase/structure, elemental composition and chromophores, respectively [6,7]. At the time of their production enamelled wares were advanced materials and their micro- and nano-structure carries a lot of information about their making process, important information to distinguish genuine from copy, or to trace technological exchanges [3-8]. We present a review of the state of the art of the non-invasive study of coloured artefacts and discuss representative examples of innovation or of technological transfer.

1. Ph. Colomban, V. Milande, L. Le Bihan, *On-site Raman Analysis of Iznik pottery glazes and pigments*, J. Raman Spectrosc. 35 (2004) 527-535.
2. Ph. Colomban, *The on-site/remote Raman analysis with portable instruments - A review of drawbacks and success in Cultural Heritage studies and other associated fields*, J. Raman Spectrosc. 43 [11] (2012) 1529-1535.
3. D. Mancini, C. Dupont-Logié, Ph. Colomban, *On-site identification of Sceaux porcelain and faience using a portable Raman instrument*, Ceramics International 42[13] (2016) 14918-14927.
4. G. Simsek, Ph. Colomban, F. Casadio, L. Bellot-Gurlet, K. Faber, G. Zelleke, V. Milande, L. Tilliard, *On-site identification of early Böttger red stonewares using portable XRF/Raman instruments: 2, glaze and gilding analysis*, J. Am. Ceramic Society 98[10] (2015) 3006-3013.
5. C. Fornacelli, Ph. Colomban, I. Turbanti Memmi, *Toward a Raman/FORS discrimination between Art Nouveau and contemporary stained glasses from CdSxSe1-x nanoparticles signatures*, J. Raman Spectrosc. 46[11] 2015 1129-1139.
6. Ph. Colomban, *The destructive/non-destructive identification of enamelled pottery and glass artifacts and associated pigments –A brief overview*, Arts 2013, 2(3), 77-110 doi:10.3390/arts2030077
7. G. Simsek, Ph. Colomban, S. Wong, B. Zhao, A. Rougeulle, N.Q. Liem, *Toward a fast non-destructive identification of pottery: the sourcing of 14th-16th century Vietnamese and Chinese ceramic shards*, J. Cultural Heritage 16[2] (2015) 159-172.
8. Ph. Colomban, Y. Zhang, B. Zhao, *Non-invasive Raman analyses of Falangcai and related Qing porcelain. Searching evidence of the use of European pigment technology*, Ceramics International, 43 (2017) pp. 12079-12088