APPEL A CANDIDATURES : MOBILITE JAPON

Texte de l'appel à projets :

La Fondation des Sciences du Patrimoine lance un appel à candidature pour l'organisation d'un séjour de recherche à l'université d'Okayama au Japon.

Cet appel est ouvert à l'ensemble des personnels des institutions membres de la Fondation.

Le séjour sera effectué sur la base d'un *projet scientifique tel que décrit ci-après*.

Les conditions de réalisation du séjour :

- durée du séjour (2 à 3 mois) durant le premier semestre de l'année 2016.

- la Fondation assure la prise en charge des frais de voyage du candidat retenu. Un défraiement sera effectué selon les mêmes principes que l'établissement d'origine du candidat retenu. Les frais de visa restent à la charge du chercheur.

- l'hébergement sur place est assuré par l'université d'Okayama. Il se fera à la Maison internationale sur le campus de Tsushima.

- la FSP assure la prise en charge des deux ou trois missions qui seront réalisées sur place dans le cadre du projet (Tokyo et Kyoto).

Dossier de candidature :

- Une lettre de motivation ainsi qu'un CV détaillé.

Modalités de sélection :

Un jury constitué de personnalités du conseil d'administration et du comité scientifique de la Fondation sera réuni durant le mois de juillet. Ce jury peut faire appel à des experts extérieurs.

Les résultats de l'appel à candidatures seront communiqués après la délibération de ce jury.

La date de clôture des candidatures est le lundi 6 juillet 2015 à 12 heures précises.

Envoi des candidatures :

Par envoi électronique à **sciences.patrimoine.aap@gmail.com**

Ou par envoi papier à : **Université de Cergy-Pontoise – Fondation des sciences du patrimoine - 33, boulevard du Port 95011 Cergy-Pontoise cedex**

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Joint Research project proposal between Okayama University – JAPAN – and the Foundation for Cultural heritage sciences – FRANCE.

"Further understanding the colour properties in Pigments used in Ceramics Japanese Arts and Technologies"

General context

Pigments in ceramics have drawn attention from immemorial times. Recently new methods to synthesized brightful red and new green pigments that may be used for technological applications or Japanese art works like Bizen pottery, have been studied. However lots of efforts have still to be done to further elucidate the origin of the colour properties exhibited by those materials and in this context a joint research proposal is made between the Foundation for Cultural heritage sciences (www.sciences-patrimoine.org) and Okayama University in Japan.

Main features

Okayama prefecture is the national center of the Bizen stoneware, the most popular ceramic used for tea ceremony because of its quiet atmosphere expressing Japanese sense of beauty called *wabi* (a display of richness and beauty in simplicity and poverty) and *sabi* (an aesthetic sense of loneliness). This stoneware is made from a superior Fe-rich clay which shows blackish, brownish, and reddish colors after firing.[3] In addition, the modern industry producing Fe-oxide-based pigments and magnetic materials has flourished in Okayama prefecture.

Different types of coloured materials.

In order to provide the applicants with wide research opportunities, the study of several types of couloured materials is planned. In the final step of the project preparation a narrower selection will be made.

a – Green pigment – Garnet structure

Atsunobu Masuno (Assistant Prof., Institute of Industrial Science, the University of Tokyo, masuno@iis.u-tokyo.ac.jp) has recently discovered a new Fe^{3+}-oxide that shows a very clear green color. To our knowledge this is the very first stable green Fe^{3+}-oxide. $Fe(OH)_2$ has been known to show a pale green color but this hydroxide is immediately oxidized when exposed to the air to a yellowish $Fe^{3+}OOH$. The compositional and structural characterization is under way. Solid state chemists good at compositional and structural characterization are needed.

b – Colour monitoring in the Bizen pottery (collaboration with John Thomas Wells : http://johnthomaswells.web.fc2.com/top.html)

A lot of scientific work has already been done to understand the origin of the colours of Bizen ware and specifically the so-called *Hidasuki* pattern. In this project an artist group led by J. T. Wells, a famous Bizen potter, and a scientist group led by T. Fujii will work together to connect pottery art and materials science. This is a totally new cut-and-try challenge without any preset goal

c – BIOX

BIOX materials Mineral deposits frequently resulting from microbian activity feature elaborate structures and unique compositions.

Prof. Jun Takada and his collaborators have been interested in a tubular deposit (*L*-BIOX) produced by a species of aquatic bacteria named *Leptothrix ochracea*. The tubes having a fixed bore diameter of ~1 µm and a variable length of up to several centimeters are an organic-inorganic composite made of an organic skeleton woven from bacterial saccharic fibrils and inorganic Fe^{3+}-based oxyhydroxide particles attached to the skeleton. The oxyhydroxide particles are extremely fine (~3 nm in diameter) and amorphous and contain also Si^{4+} and P^{5+} mixed at an atomic ratio of Fe:Si:P ~73:22:5.[1] *L*-BIOX is a very common material which can be identified as ocher deposits in natural streams, irrigation canals, ditches, and even near ocean hydrothermal vents. *L*-BIOX has been found to have potential as catalyst supports, carriers for cell culture, battery electrodes, and precursors for pigments.[2]

L-BIOX is heterogenized by electrochemical[1] or thermal[2] treatments. When heated at 600–1100°C in air for 2 h, vivid red-colored powder including α-Fe_2O_3 (hematite) and amorphous silicate form. The most beautiful sample obtained at 800°C shows a light yellowish-red color with L^* = 47.3, a^* = 34.1, and b^* = 34.6. According to TEM microscopic observations, crystalline hematite particles of ~40 nm in diameter are covered with amorphous silicate of ~5 nm in thickness, and these particles are intricately interconnected to form microtubes with an average diameter of 1.26 µm. This structure and color do not degrade even after reheating at 800°C. This means that this material can be used as a new type of overglaze enamel.

Organisation of the project, scientific content of the invited researcher position

A - Project leaders at Okayama University

- Main leader : Professor Fujii
- Scientific supervisors : Professors Takada, Kusano, Takano
- Research management : Dr. Chenevier, CNRS Director, URA at Okayama University

B - Partnership.

a - Laboratories and Universities

In this project preparation and characterization of Fe-oxides to be used as pigments, hematite and others, will be carried out in collaboration with solid state chemists (represented by Prof. T. Fujii, Okayama Univ), electron miscroscopists (represented by Prof. Y. Kusano, Kurasiki Univ. of Science and the Arts), Professor Masuno from University of Tokyo (see above)

b - Art Experts

Bizen potters (hopefully represented by J. T. Wells, http://johnthomaswells.web.fc2.com/top.html), the ceramic team of Kyoto Municipal Inst. of Industrial Technology and Culture (http://tc-kyoto.or.jp/), TODAKOGYO Co. (http://www.todakogyo.co.jp/english/), and others.

C - Invited Researcher Profile

The scientist should be familiar with solid state chemistry in a broad sense. This includes research level knowledge in the fields of synthesis of metal oxide compounds, structural analysis including X-ray diffraction for crystallography analysis and TEM (Transmission Electron Microscopy) for observations of structural details at the nanometer range. As most of the compounds studied in this project get their bright–colours from the presence of different iron valences, significant know-how in the field of Fe-Mössbauer spectroscopy will be appreciated.

References

1. H. Hashimoto *et al.*, Bacterial nanometric amorphous Fe-based oxide: a potential lithium-ion battery anode material. *ACS Applied Materials & Interfaces*, **6**, 5374-8, (2014).

2. H. Hashimoto *et al.*, Preparation, Microstructure, and Colour Tone of Microtubule Material Composed of Hematite/Amorphous-Silicate Nanocomposite from Iron Oxide of Bacterial Origin. *Dyes Pigm.* **95**, 639–643 (2012).

3. Y. Kusano *et al.*, Science in the Art of the Master Bizen Potter. *Acc. Chem. Res.* **43**, 906-915 (2010).