POST-DOCTORAL POSITION OFFER
MMC (ESPCI ParisTech, UMR 7167) - PCMTH (C2RMF , IRCP, UMR 8257)

Title: Reactive colloidal systems: preservation of unfired clay artifacts.

State of art:
Using ethylsilicate to consolidate raw clays started in the early 90's. This method seemed particularly well adapted to the preservation issues of earthern architecture, whether building structures themselves or painted coatings. Implementing protocols and evaluating the preservation of treated structures over 5 years led to many studies that have been presented in various symposia. In 1996, this processing has been adapted to smaller parts, in particular Mesopotamian cuneiform tablets preserved in museums and gave satisfactory results, whether for its ease of implementation or the consolidation. Indeed, once treated, the part is desalt by immersion in pure water and can be later manipulated, for instance for epigraphic studies.
Yet, many questions remain unsettled and notably interactions between clays and ethylsilicate are not perfectly understood. Accordingly, the use of this treatment gives rise to numerous controversies in the museum preservation community. Specifically, for tens of thousands of the Mesopotamian tablets preserved in major museums, two opposing schools of thoughts exist: the first one, for instance the British Museum, recommends the annealing of mud-parts while the second one, the Musée du Louvre, promotes the use of ethylsilicate, more friendly with the original material. Beyond cuneiform tablets, this preservation issue concerns all existing mud parts: sculptors' models, ethnographical objects, the repairing of polychromic decorations applied on a clayey layer for some Greek statuettes, …

Scientific project:
The project aims to get a better knowledge on how ethylsilicate TEOS can consolidate clayey materials, and proposes two complementary research areas:

- the identification of the interactions that take place between TEOS and the various clay families and of the chemical nature of the silica species that form (gels, films, particles, …)
- the study of the ageing of the identified silica species, and specially their possible reactivity

Two reference clays, as pure as possible, will be used to establish their specific chemical behavior in presence of TEOS. Related to the clays found in archeological blend and determined previously as the most reactive, kaolinite and smectite clays are chosen.
The results of these studies should allow determining optimal conditions to form silica species that would be efficient for the consolidation and stable in regard with the preservation conditions.

Required Skills:
- Solid experience required in sol-gel chemistry
- Appreciated knowledge in characterization of materials (DRX, DLS, MEB, TEM, BET, TGA, IR, …)

Post-doctoral PSL fellowship of 18 months starting before January 2016. Salary ~ 2200 euros/month.

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