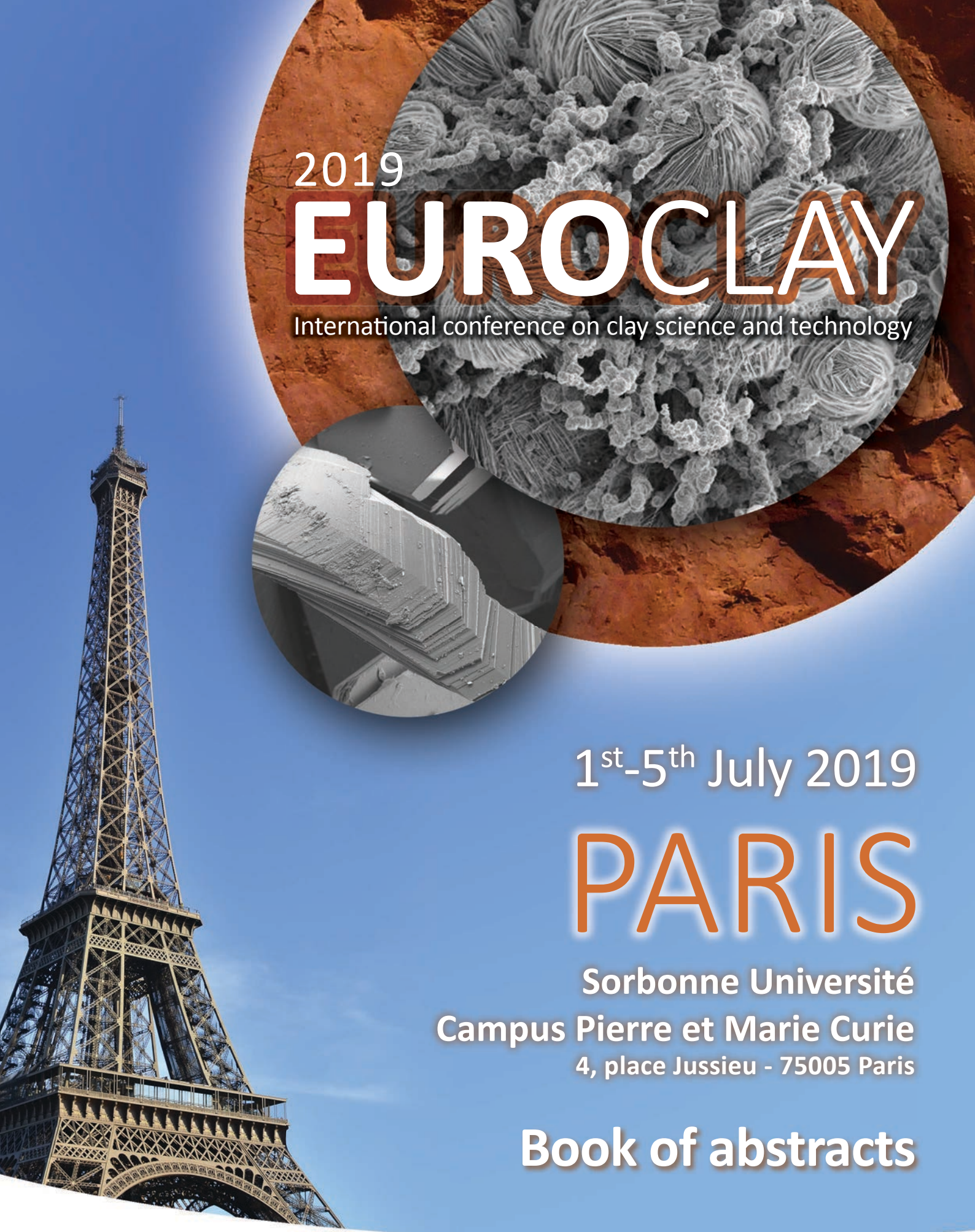
2019

EUROCLAY

International conference on clay science and technology



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Sorbonne Université
Campus Pierre et Marie Curie
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Book of abstracts

ECGA

The Clay Minerals Society

MCM

GFA Groupe Francais des Argiles

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Carbon paste electrode modified with cobalt-impregnated pillared smectite for analytical detection of glucose

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Glucose detection is of great importance in diabetes control, food industry and bioprocess monitoring [1]. In recent years, non-enzymatic glucose sensors (NEGS) have been widely studied. NEGS based on nanostructured transition metal oxides supported on graphene, carbon nanotube and ordered mesoporous silica based-materials have been studied due to their low cost, easiness of synthesis and high electroactivity [2].

In this work aluminum pillared clay (AP) with well-defined porous structure was chosen as the supporting material for cobalt oxides. The incorporation of cobalt oxides in pillared clay was performed using the incipient wetness impregnation method (CoAP) followed by heat treatment at 450 °C. Carbon paste electrode (CPE) modified with CoAP (CP-CoAP) was prepared in order for CoAP to be tested as a novel glucose sensing material. The CP-CoAP was prepared by mixing CoAP, carbon black (CB) with paraffin oil and packed into the hollow Teflon tube. Cyclic voltammetry was employed to evaluate the performance of CP-CoAP in NaOH solution with and without glucose. Bare CPE (CP-CB) and CPE modified with AP (CP-AP) were also tested.

There were no peaks observed for CP-CB and CP-AP neither in NaOH solution, nor in glucose containing solution. On the other hand, cyclovoltammogram (CV) of CP-CoAP in this supporting electrolyte exhibited well-defined peaks that can be attributed to oxidation/reduction cobalt oxide/hydroxide species [3]. Therefore, successful incorporation of cobalt into the AP was proven. The addition of glucose to NaOH solution resulted in the appearance of anodic peak corresponding to the oxidation of glucose. The CV of CP-CoAP at different concentrations of glucose showed that glucose oxidation peak current was directly proportional to glucose concentration. In this manner the possibility of applying carbon paste electrode containing cobalt impregnated aluminium pillared smectite for the analytical detection of glucose was confirmed.

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