



ÉCOLE NATIONALE SUPÉRIEURE
DE CÉRAMIQUE INDUSTRIELLE

Master internship proposal (6 months) – ENSCI – GEMH and SPCTS Laboratories

Title:

Textured ceramics using phyllosilicates: formulation-processing-properties.

Supervisor: *Gisèle Laure Lecomte*

Detailed subject

The proposed study is in line with challenging processing of unique and sustainable ceramics that can be used for traditional as well as technical and functional applications. This work will emphasize on the deflocculation of ceramic suspensions and the texturation of related products regarding the effect of the shaping process on the properties of use of these products after sintering. .

The main objective of the work is to master the organization of unit bricks, hereby clay particles, thank to both formulation and shaping process. The raw materials are namely: kaolin, palygorskite and talc. Concerning the formulation stage, we aim at investigating the dispersion state (zeta potential, pH value, rheology) of suspensions of kaolin, kaolin-palygorskite and kaolin-talc in order to meet the requirements needed for the tape casting process. For the shaping process stage using tape casting, we will have to optimize the working parameters such as the casting rate and the band thickness. Depending on the research progression, we may check the feasibility of fabricating multilayered and multi-compositions clay-based tapes. Once the green tapes are obtained, the subsequent drying will be performed using lyophilization (freeze-drying). Therefore, the effect of the previous freezing conditions on the dry tapes will be discussed. The further consolidation of the as-obtained dry tapes will be achieved by sintering, using the appropriate thermal cycle regarding the physical and chemical evolution of each selected composition upon heating (dilatometry, DTA and TGA measurements). Finally, the influence of the composition and the sintering on the physical and chemical characteristics as well as the properties of use of the dry and sintered products will be analyzed.

The present fundamental study on the formulation and the shaping through tape casting of clay-based ceramics is a key step in a developing research activity regarding the tuning of the final properties of ceramic products thanks to the mastering of the multi-scale structural organization. The results may contribute in **manufacturing less energy consuming, environmental-friendly and more affordable novel/original products using phyllosilicates-oxides materials, shaped by modified conventional processes.**

