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**800**  
ANNI



UNIVERSITÀ  
DEGLI STUDI  
DI PADOVA

Dipartimento di Scienze Chimiche

Tesi di Laurea Triennale in Scienza dei Materiali

# UTILIZZO DI ARGILLE COME MATERIALI DA COSTRUZIONE: PASSATO, PRESENTE E FUTURO

Studente:

**Luca Marangon**

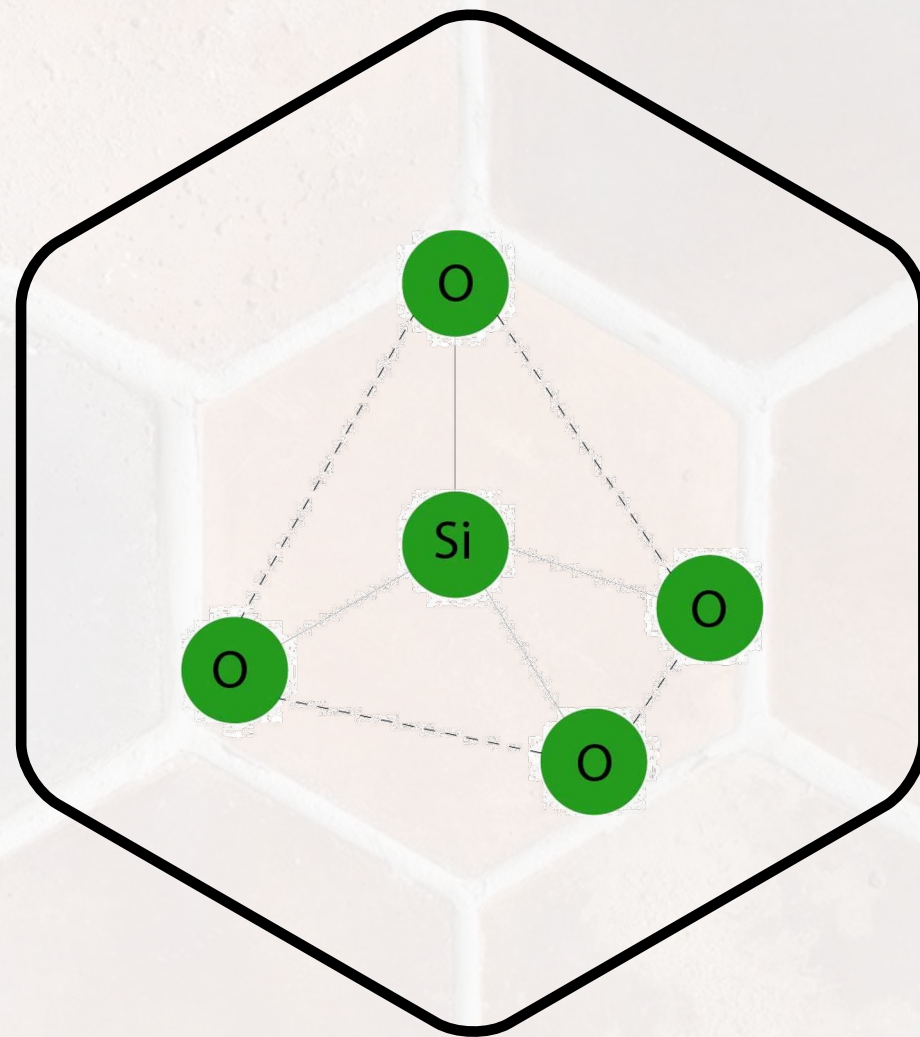
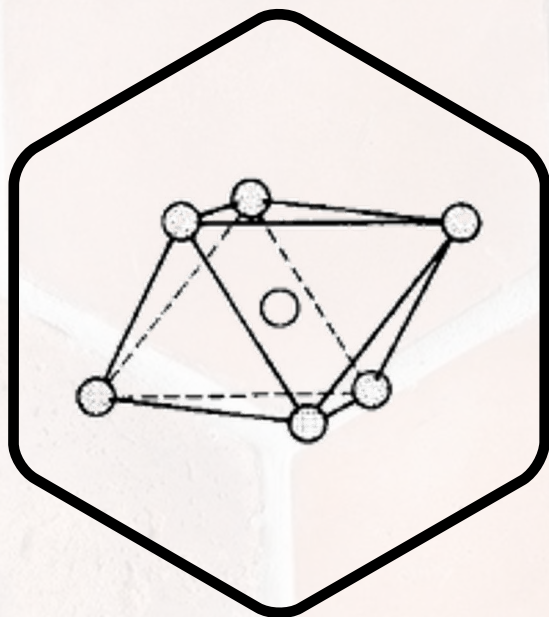
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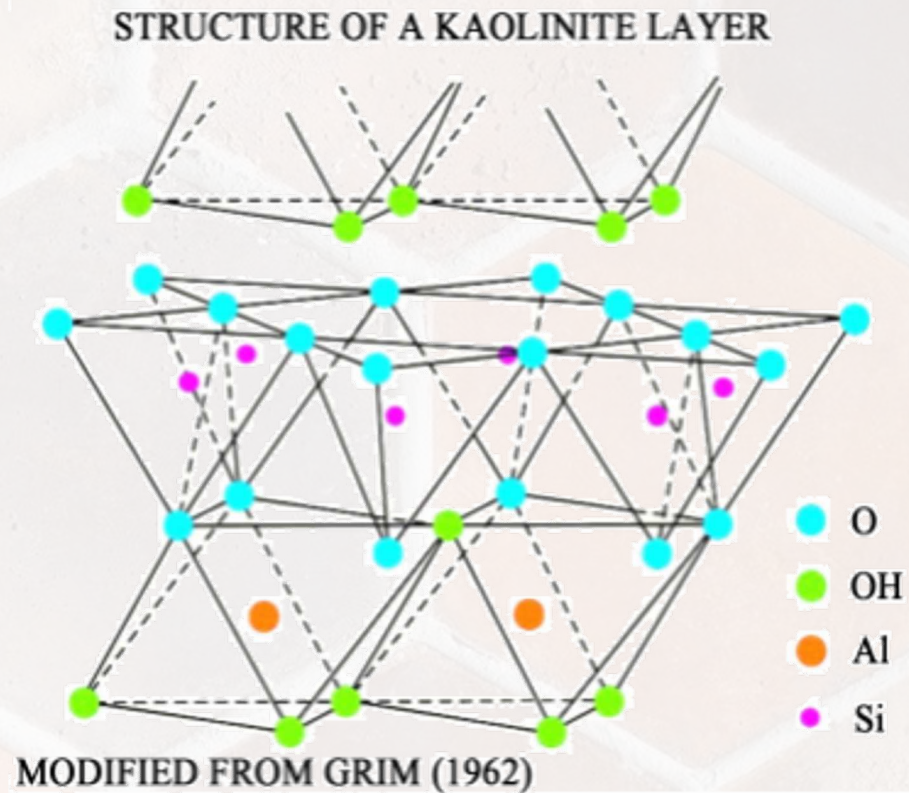
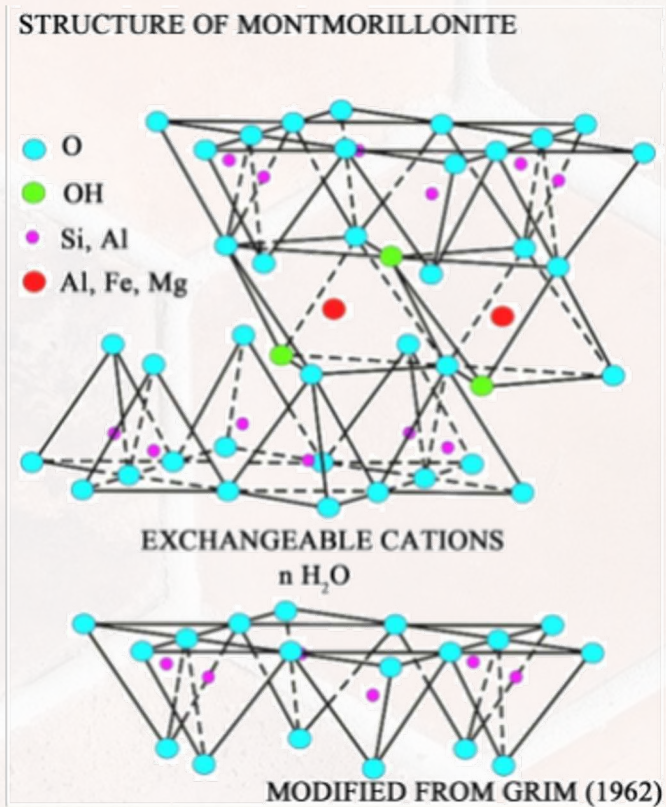
Relatrice:

**Antonella Glisenti**

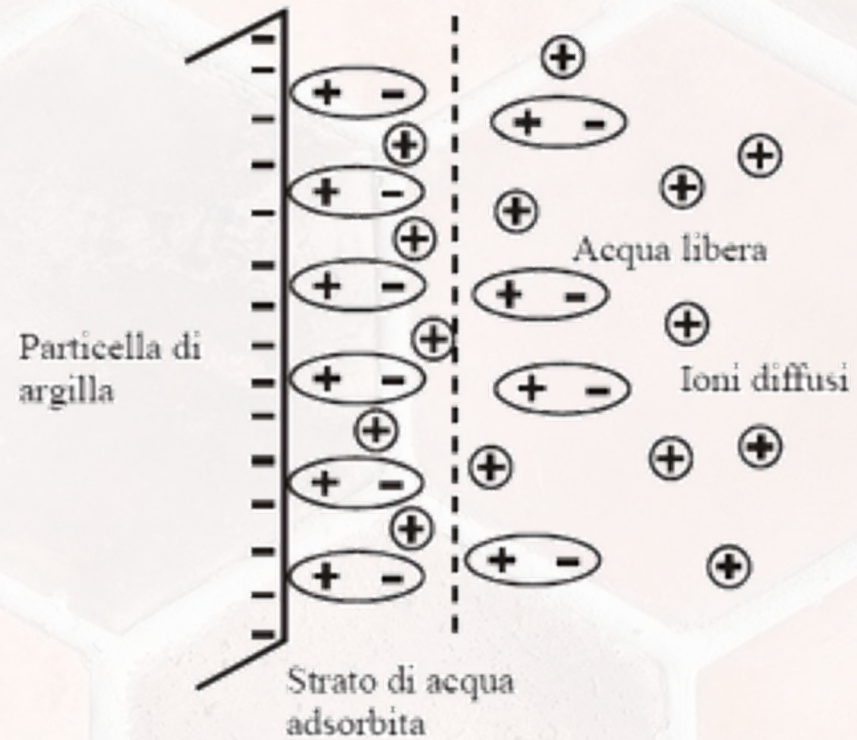
Anno accademico 2022-2023

# Cos'è l'argilla?



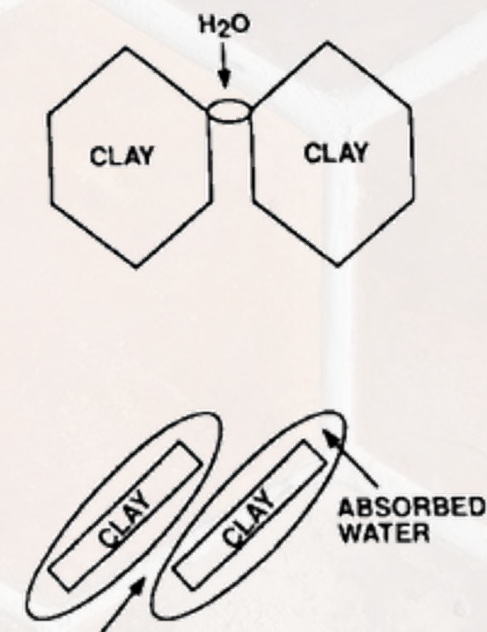


## FINEZZA



## PLASTICITÀ

Allumina
Silice
Allumina
Silice

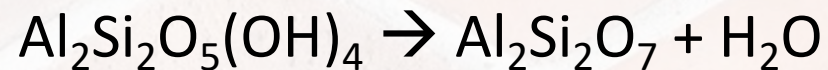


## ARGILLA CALCINATA

La calcinazione è un trattamento termico utilizzato per aumentare la reattività delle argille in presenza del cemento Portland e in ambiente alcalino.

La caolinite diventa amorfa a 600°C, mentre la smectite e l'ilite richiedono temperature di almeno 800°C.

Condizioni di reazione comuni: 5 ore, 800°C

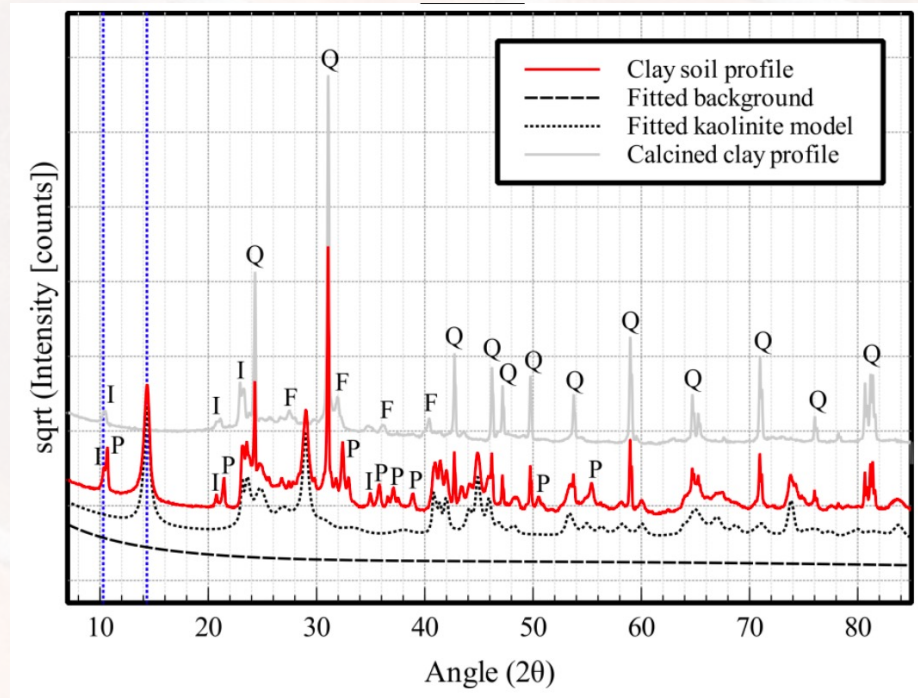


Caolinite → Metacaolinite

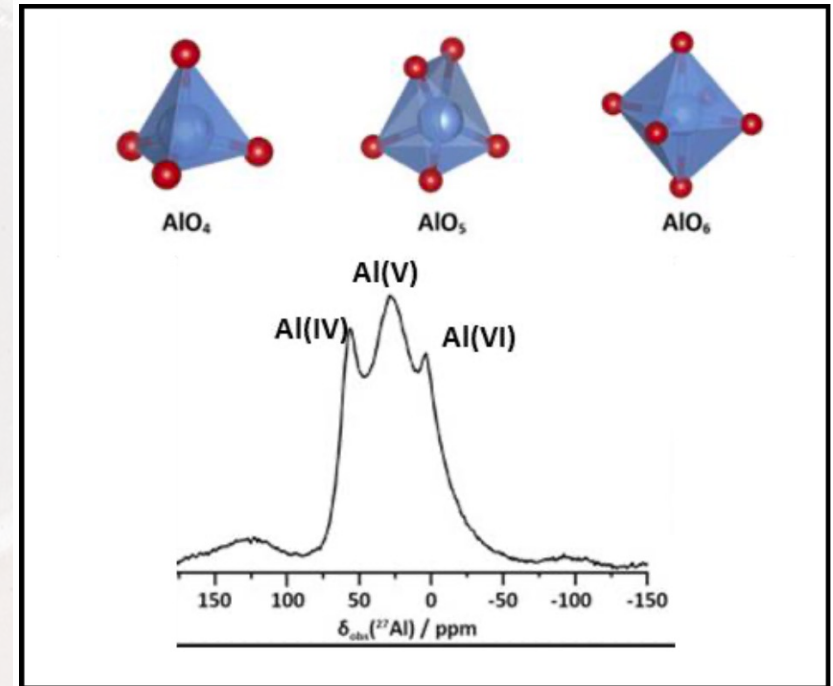


# ARGILLA CALCINATA

Metodi di caratterizzazione e risultati sperimentali:



XRD



NMR  $^{27}\text{Al}$

## ARGILLA ESPANSA



Forma naturale



Prefabbricati in  
argilla espansa



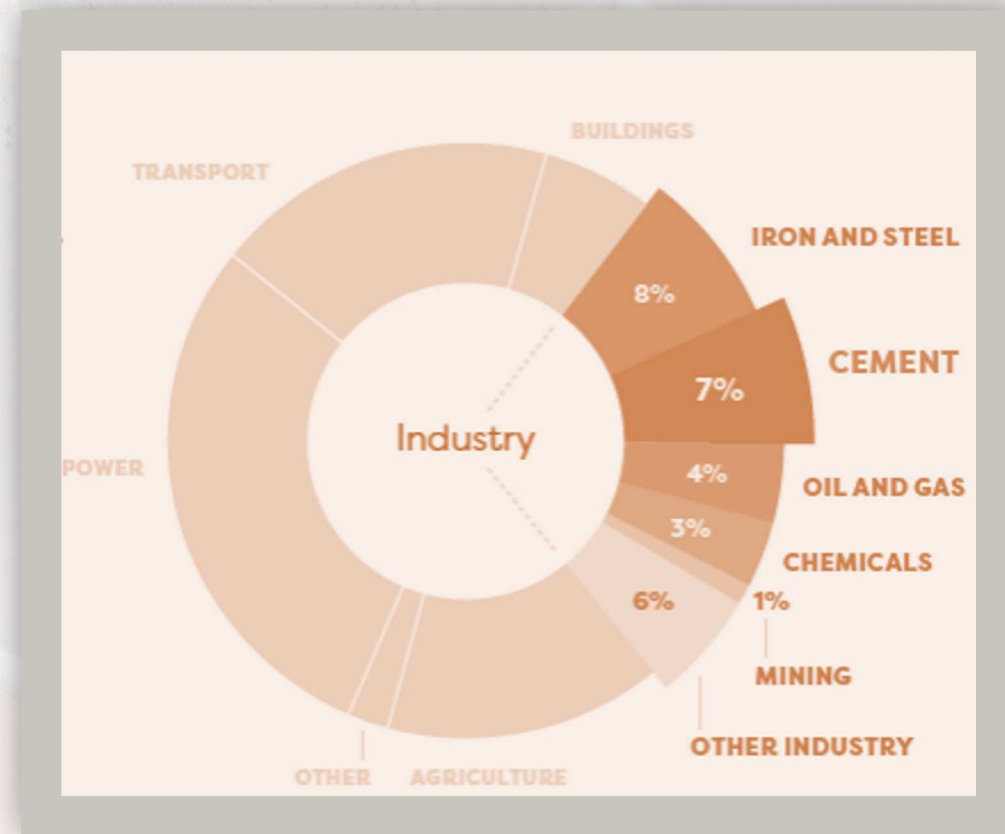
Bioclima superlight

## L'impatto del cemento

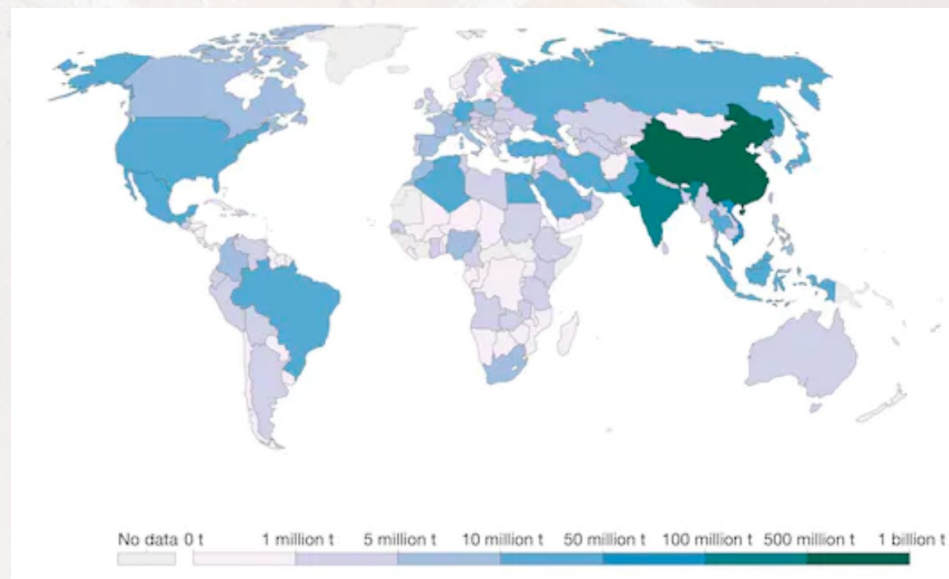
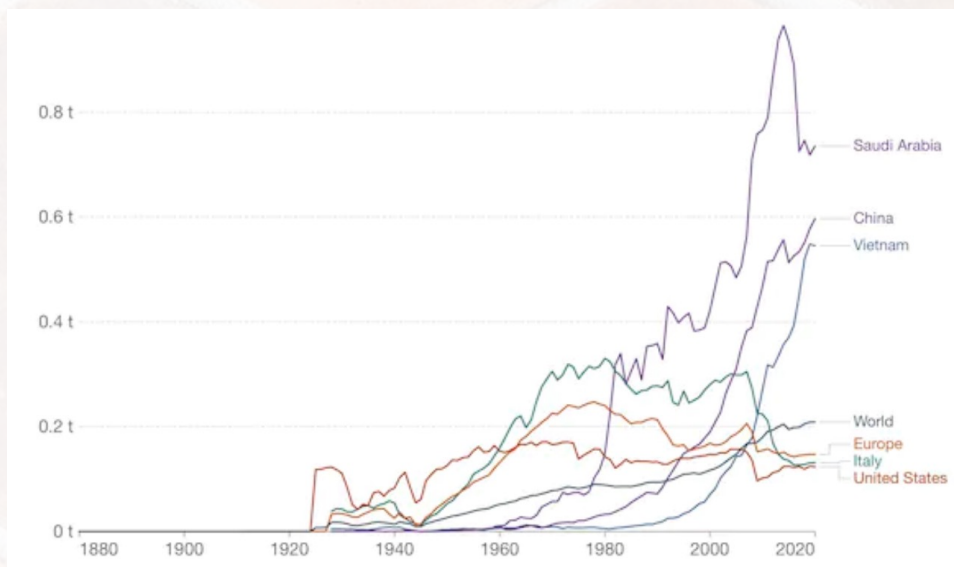
Ogni anno sono prodotti più di 3 mld di tonnellate di CO<sub>2</sub>

CO<sub>2</sub> formata dai processi:

1. combustione del carbone
2. calcinazione



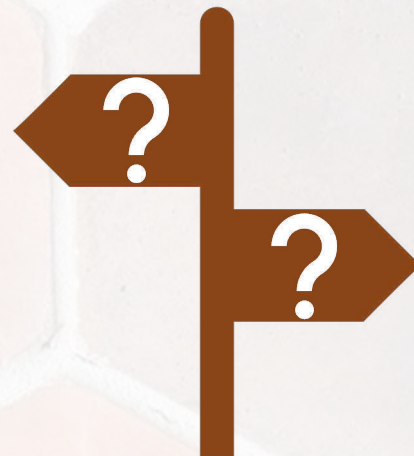
## L'impatto del cemento



Emissioni annue di CO<sub>2</sub> pro-capite da cemento basate sulla produzione, misurate su tonnellate per persona (2020).

Non si tiene conto delle emissioni da scambi commerciali.

## Cemento o argilla?



## I MATTONI CRUDI



Ziggurat  
Mesopotamia  
2000 a.C.

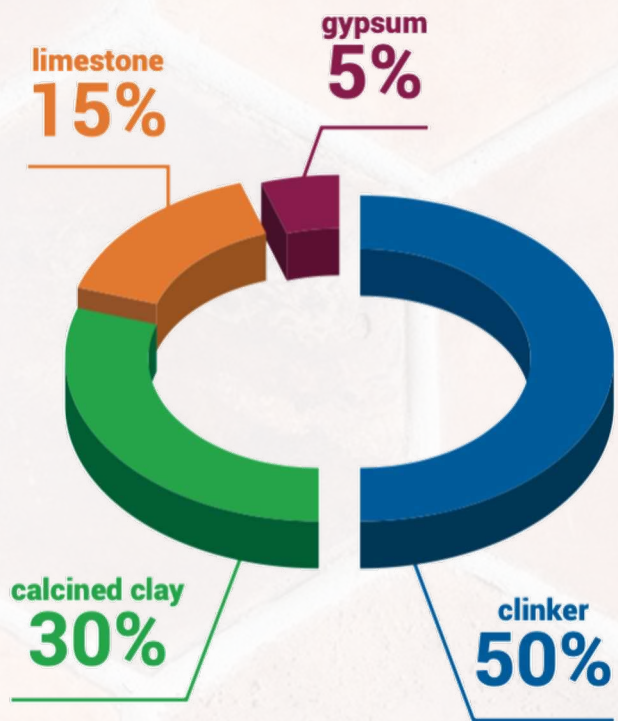
## PASSATO O PRESENTE?



Mattoni in argilla crudi

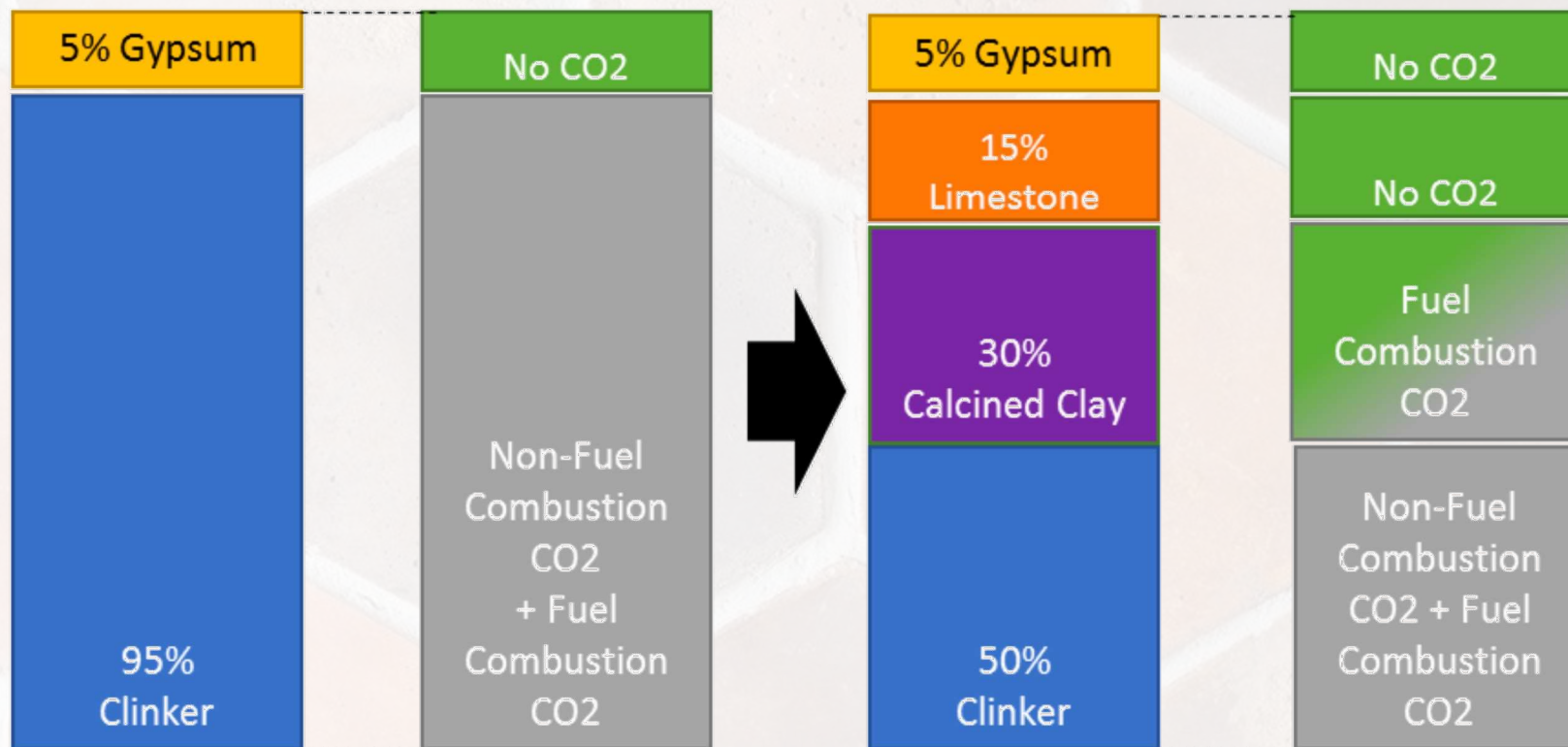


Grande moschea Djenné



Composizione

### LC3

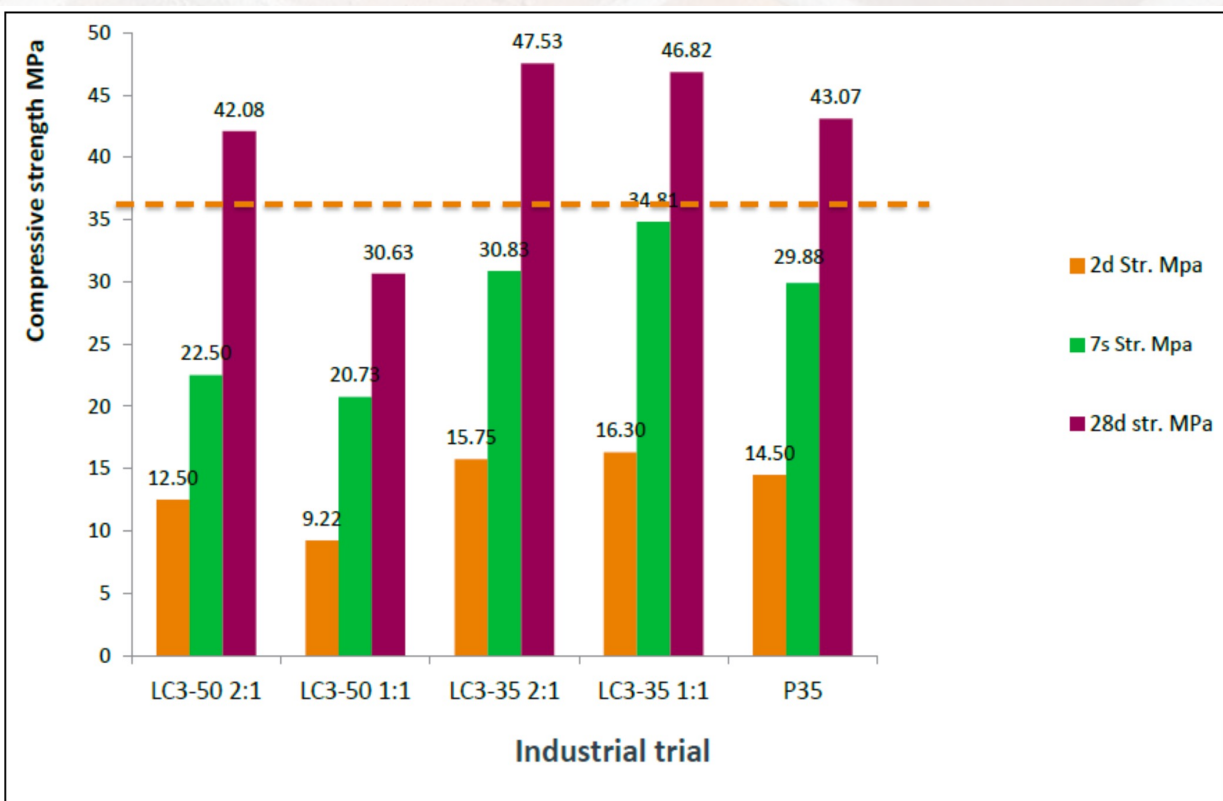
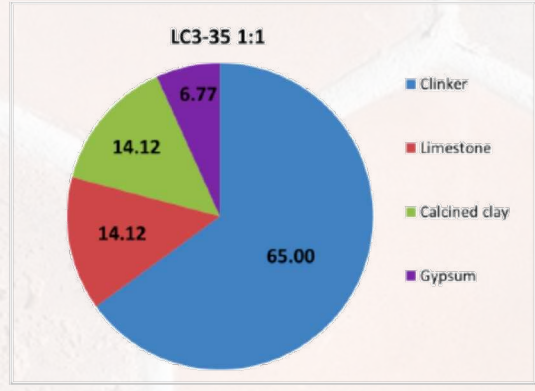
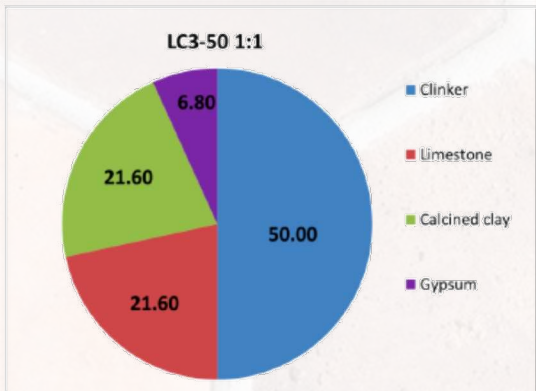
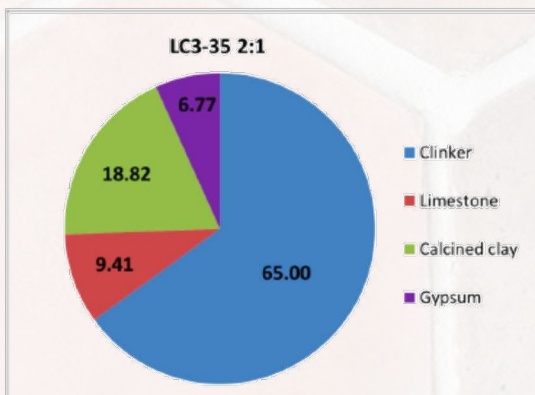
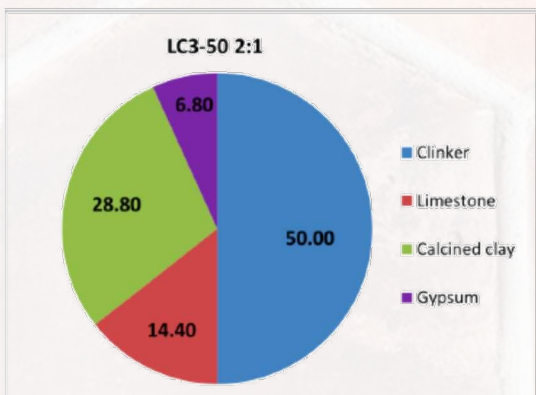


CEM 1

LC3

# LC3

Confronto tra sistemi a composizioni relative differenti:



## EDIFICI 3D



Model House in Jhansi  
Costruzione in LC3



Tecla

*Un ringraziamento alla professoressa Glisenti e al professor Luca Valentini per il supporto ricevuto durante l'ideazione e la stesura del mio progetto di tesi.*

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