

Participation and contribution

RILEM TG2

# Description of internal structure by optical imaging

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# Description of internal structure by optical imaging

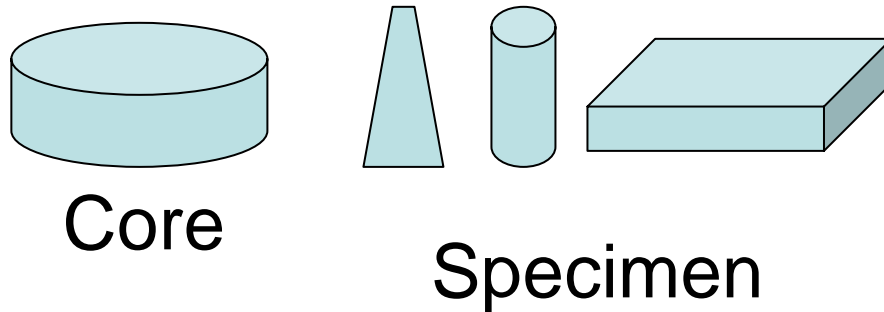
## Motivation

- 1- Towards better description of asphalt materials
- 2- Compare between different method of preparation (site and lab)
- 3- give a more accurate method to investigate the recycled mixes
- 4- Understanding and link the performance with internal structure
- 5- Generate and simulate an asphalt material with discrete method

# Description of internal structure by optical imaging

## Main principles

### 1- sample preparation



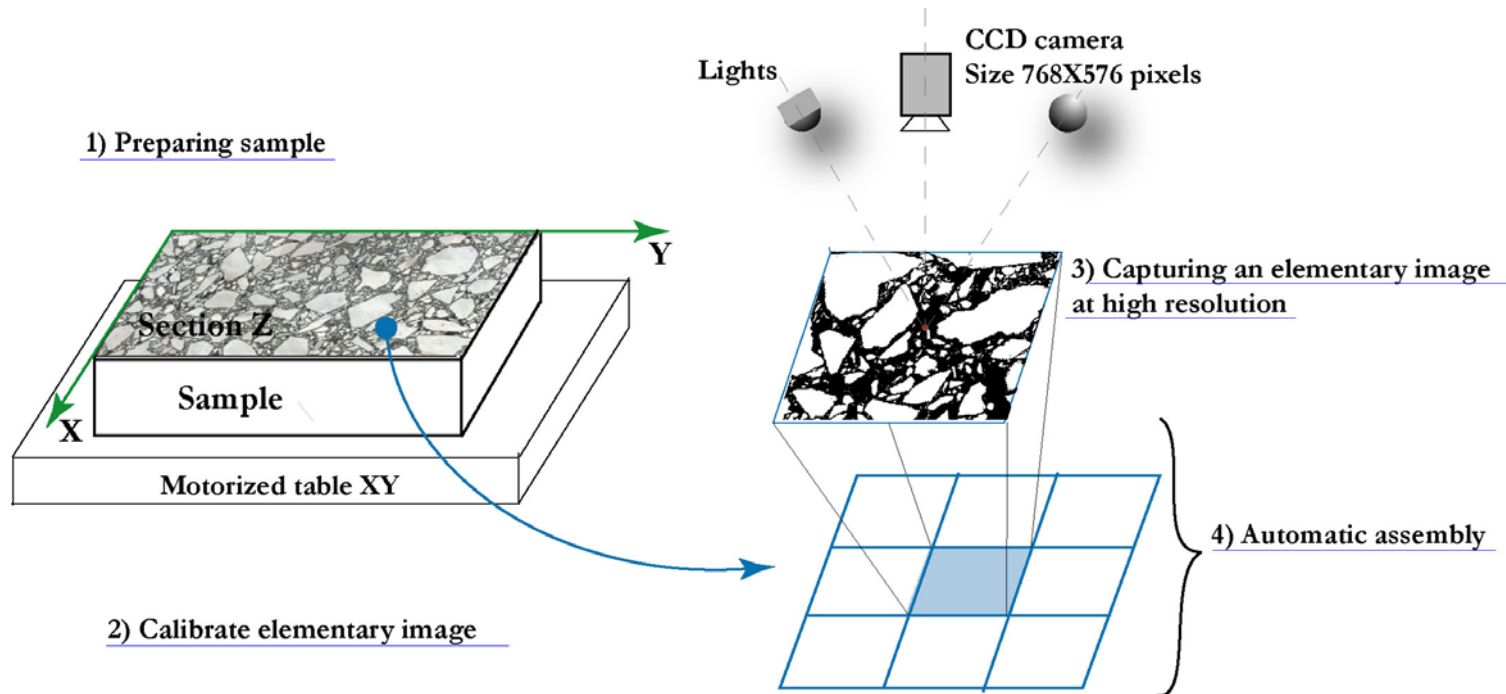
### 2- image acquisition and treatment

### 3- pertinent characteristics

(grading curve, arrangement, homogeneity, etc...)

# Description of internal structure by optical imaging

## Image acquisition

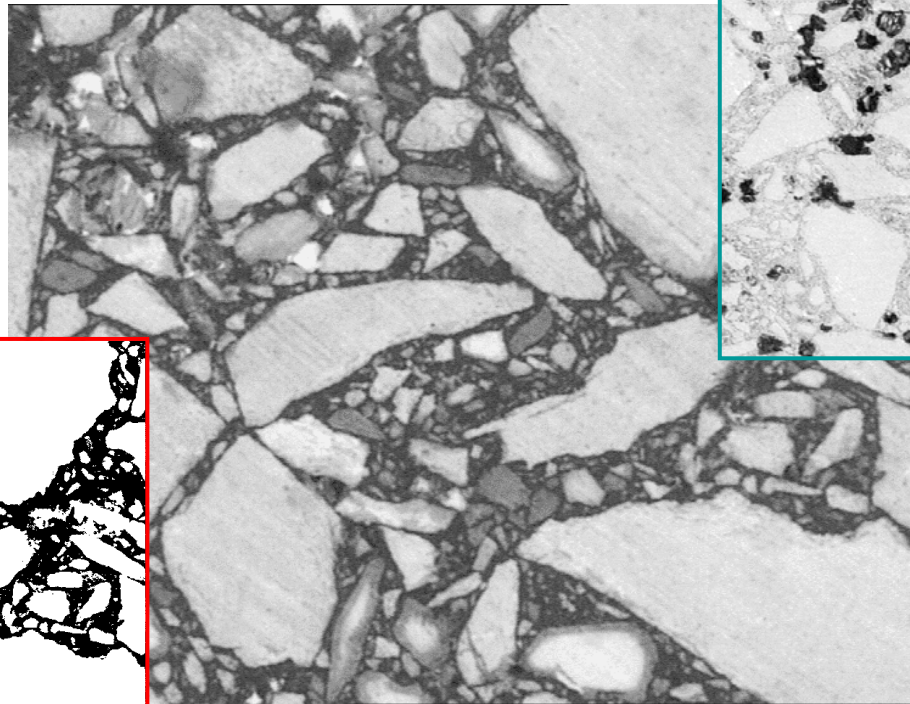
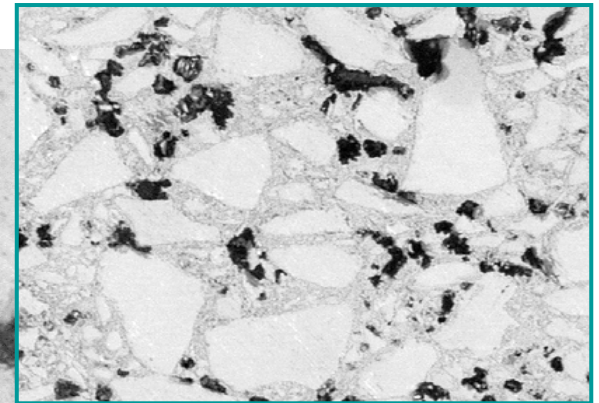


A large image with a high resolution !

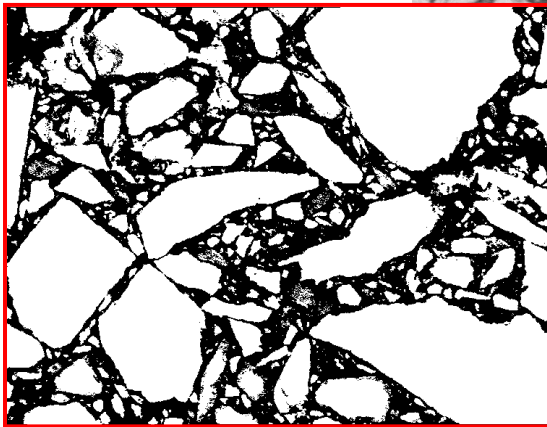
# Description of internal structure by optical imaging

## Identification of different phases

voids



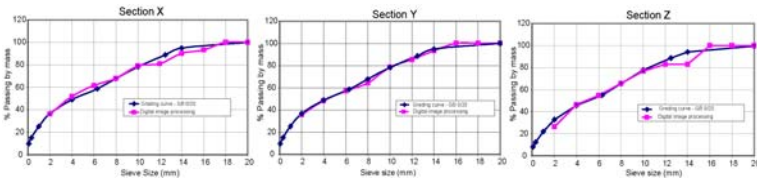
Granular media



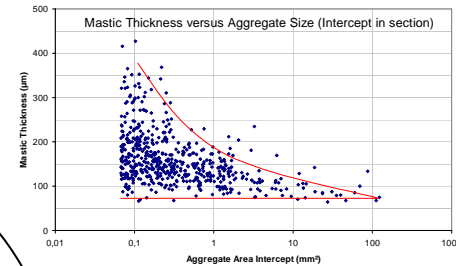
# Description of internal structure by optical imaging

## Application

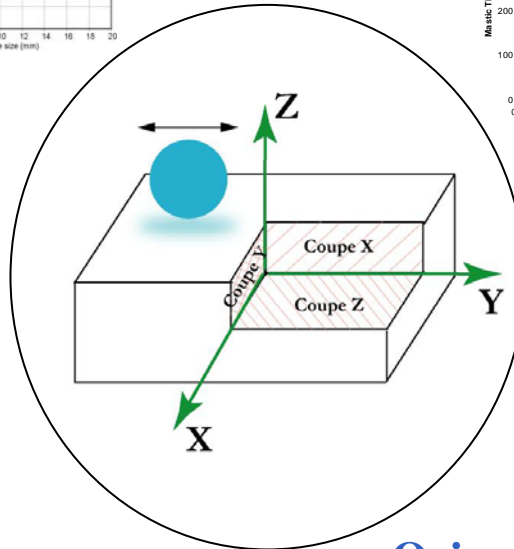
### Grading curve



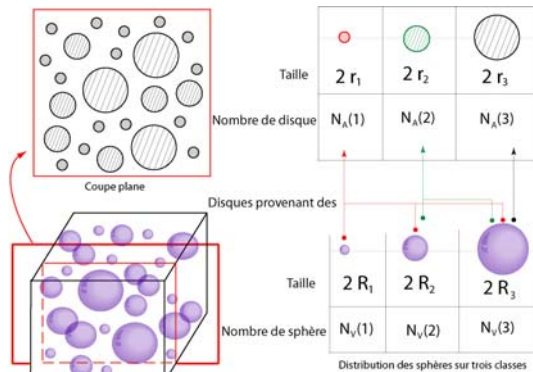
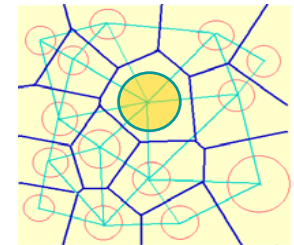
### Mastic thickness



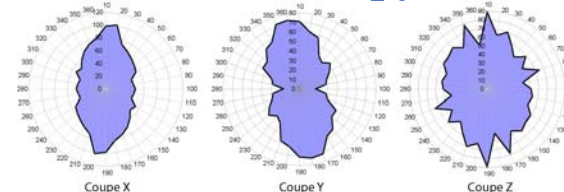
(Eurobitume, 2004)



### Spatial distribution (Voronoi discretization)



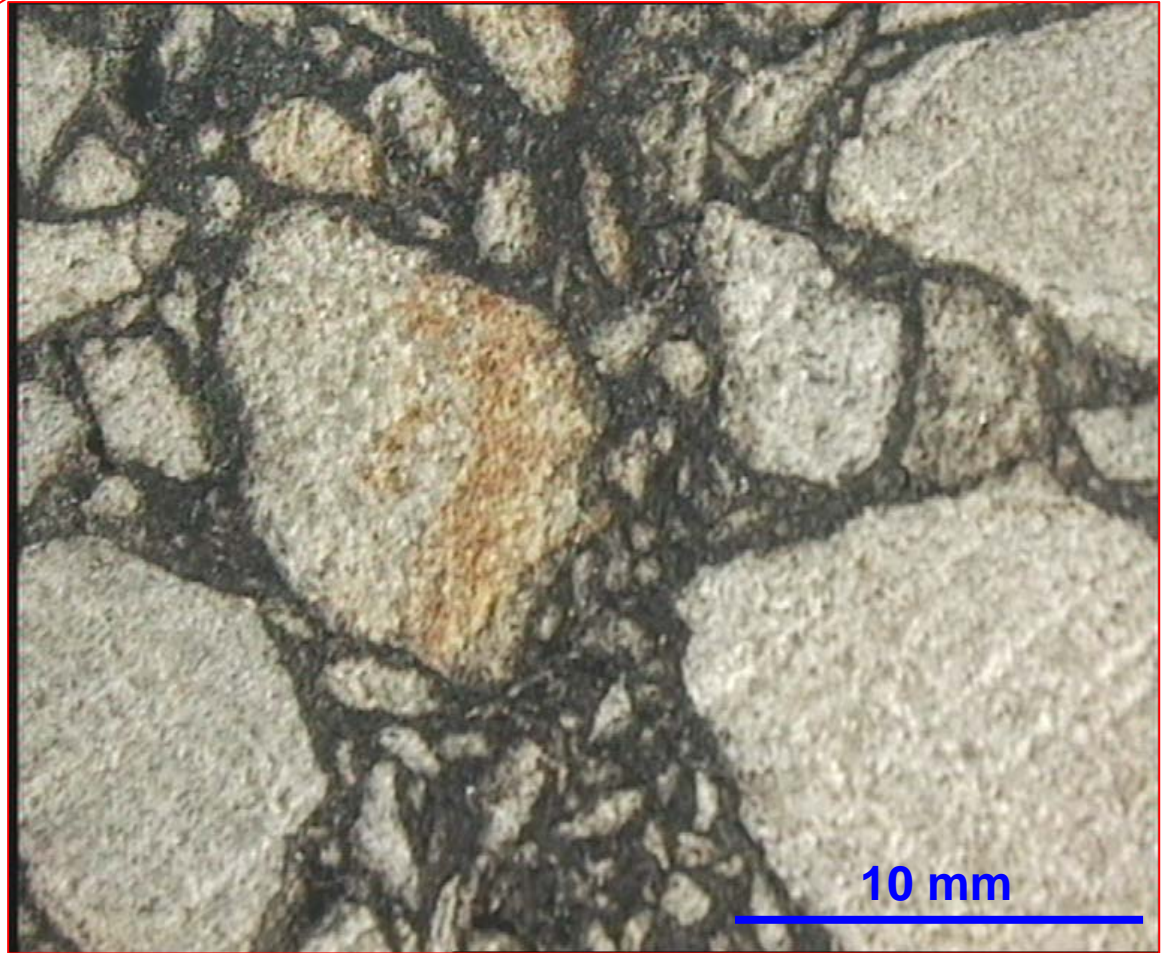
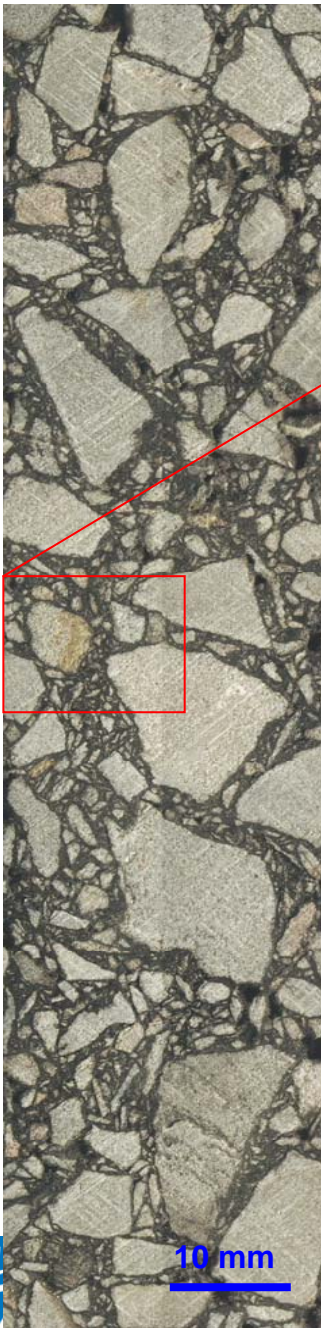
### Orientation of aggregates (anisotropy)



### Volumetric distribution (stereometry+ probability)

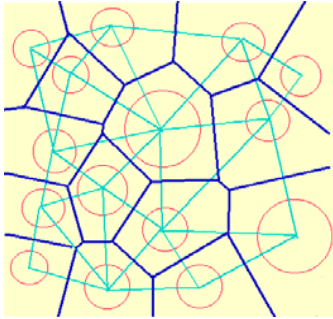


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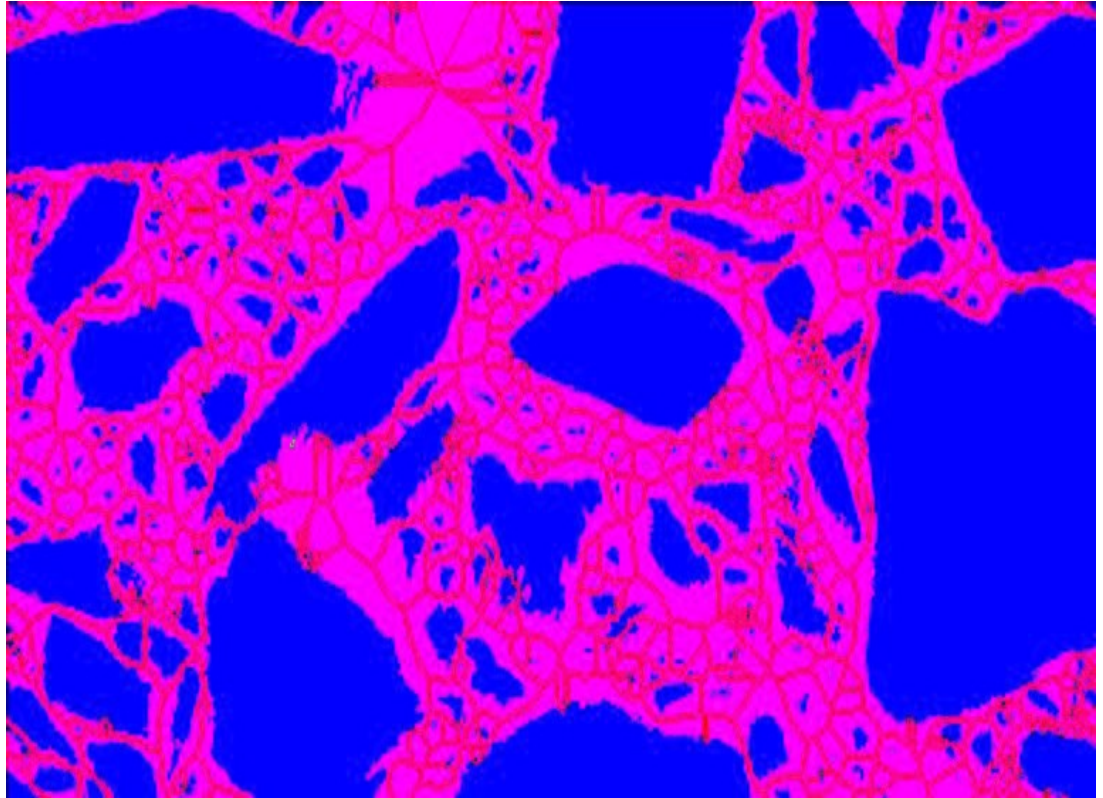


Resolution : 20,4  $\mu\text{m}/\text{pixel}$

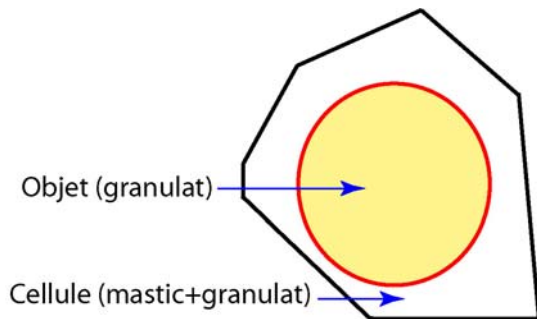
# Description of internal structure by optical imaging



Voronoi construction



GB 0/20

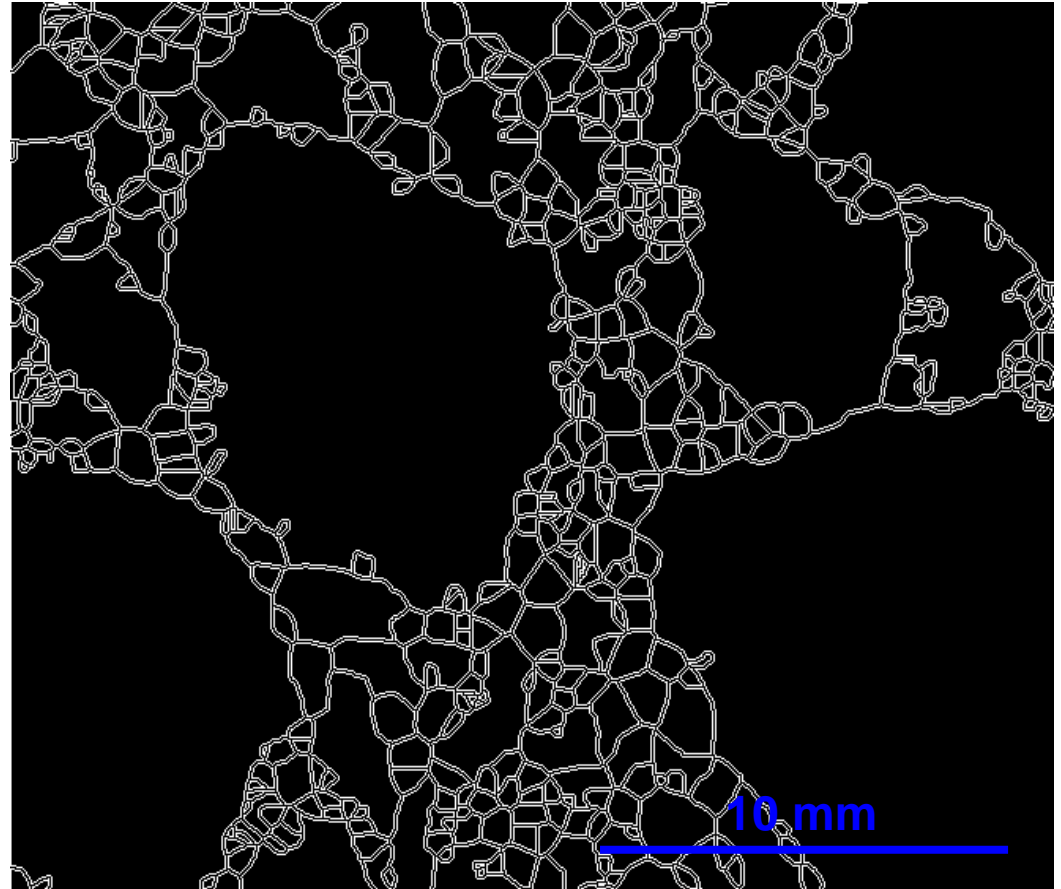
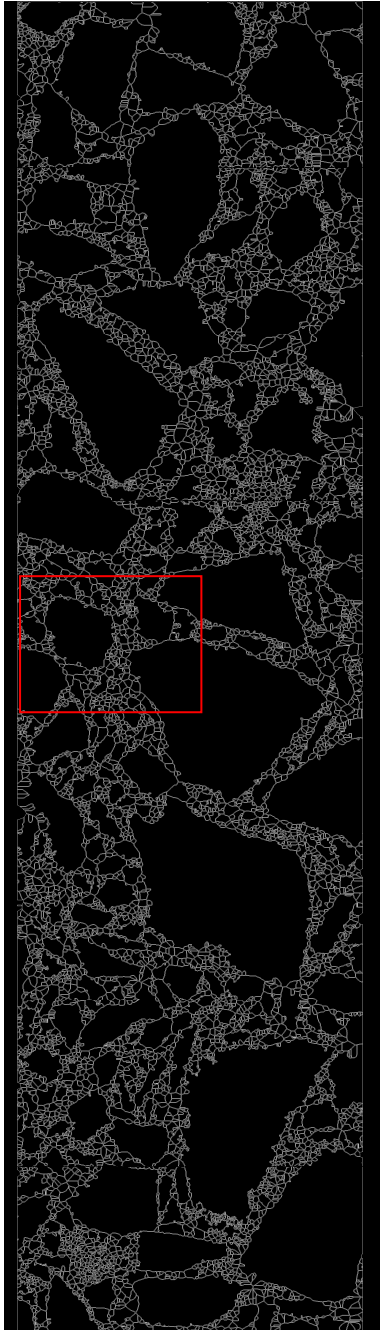
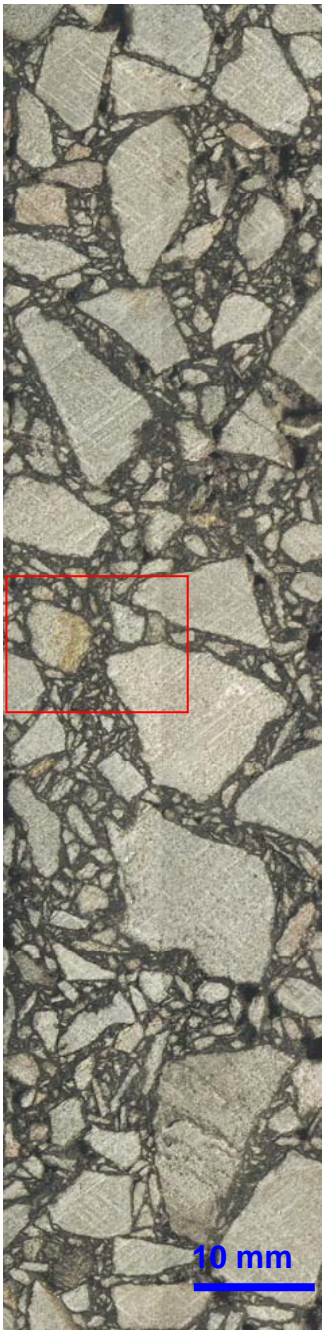


$$\text{Fraction locale} = 100 \times \frac{\text{Aire de la cellule}}{\text{Aire de l'objet}}$$

Definition of Local fraction

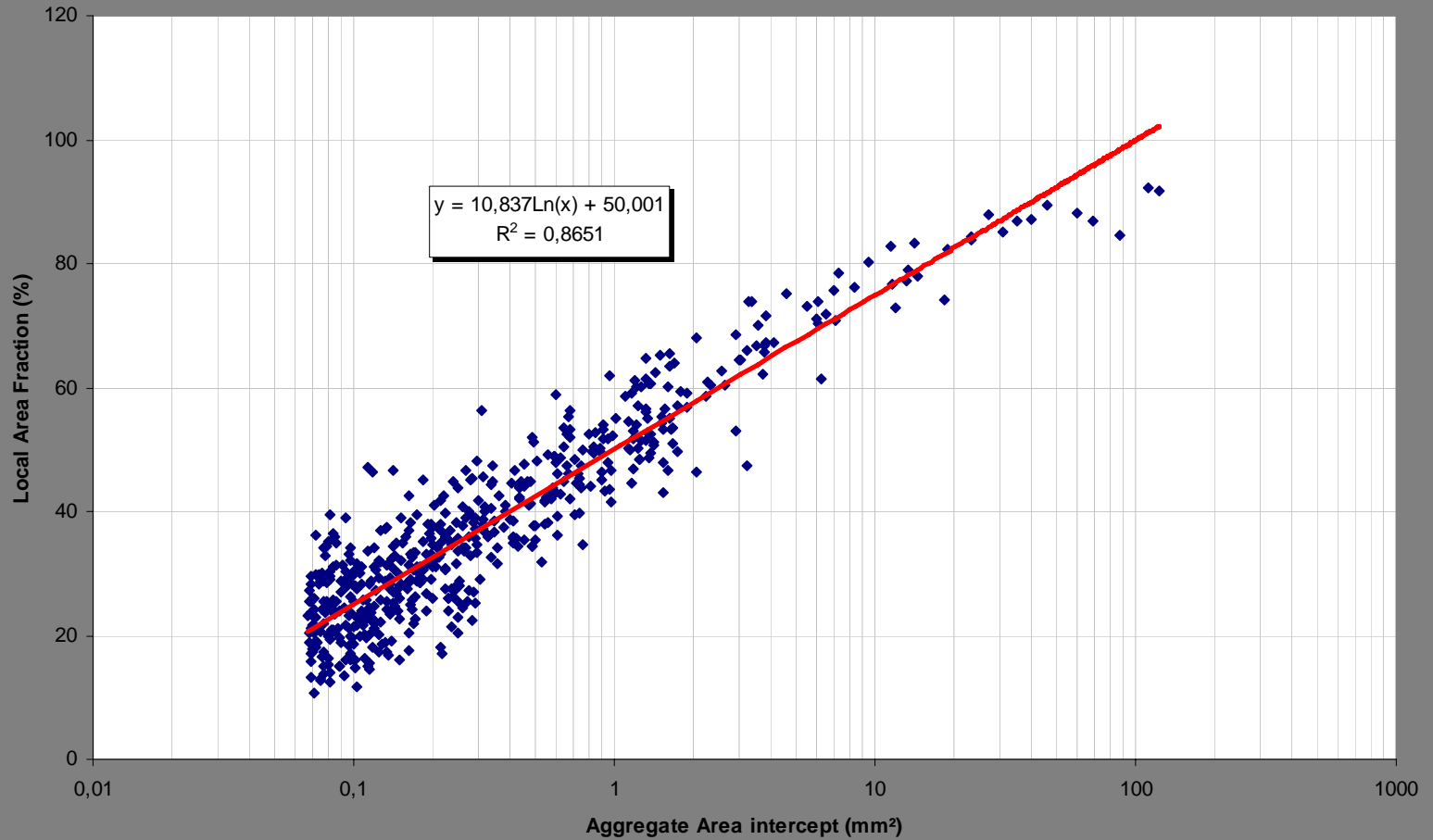


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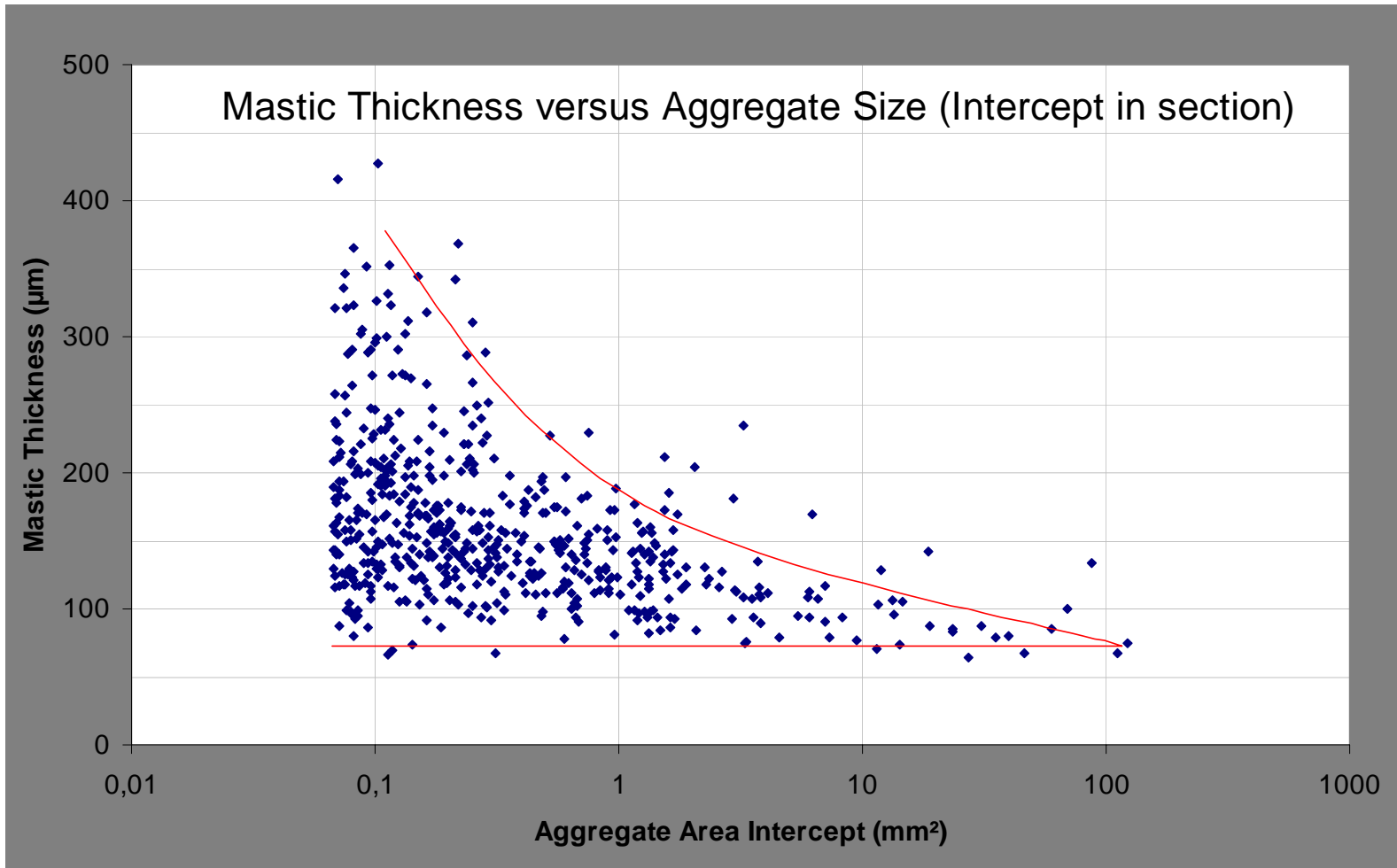


Resolution : 20,4  $\mu\text{m}/\text{pixel}$

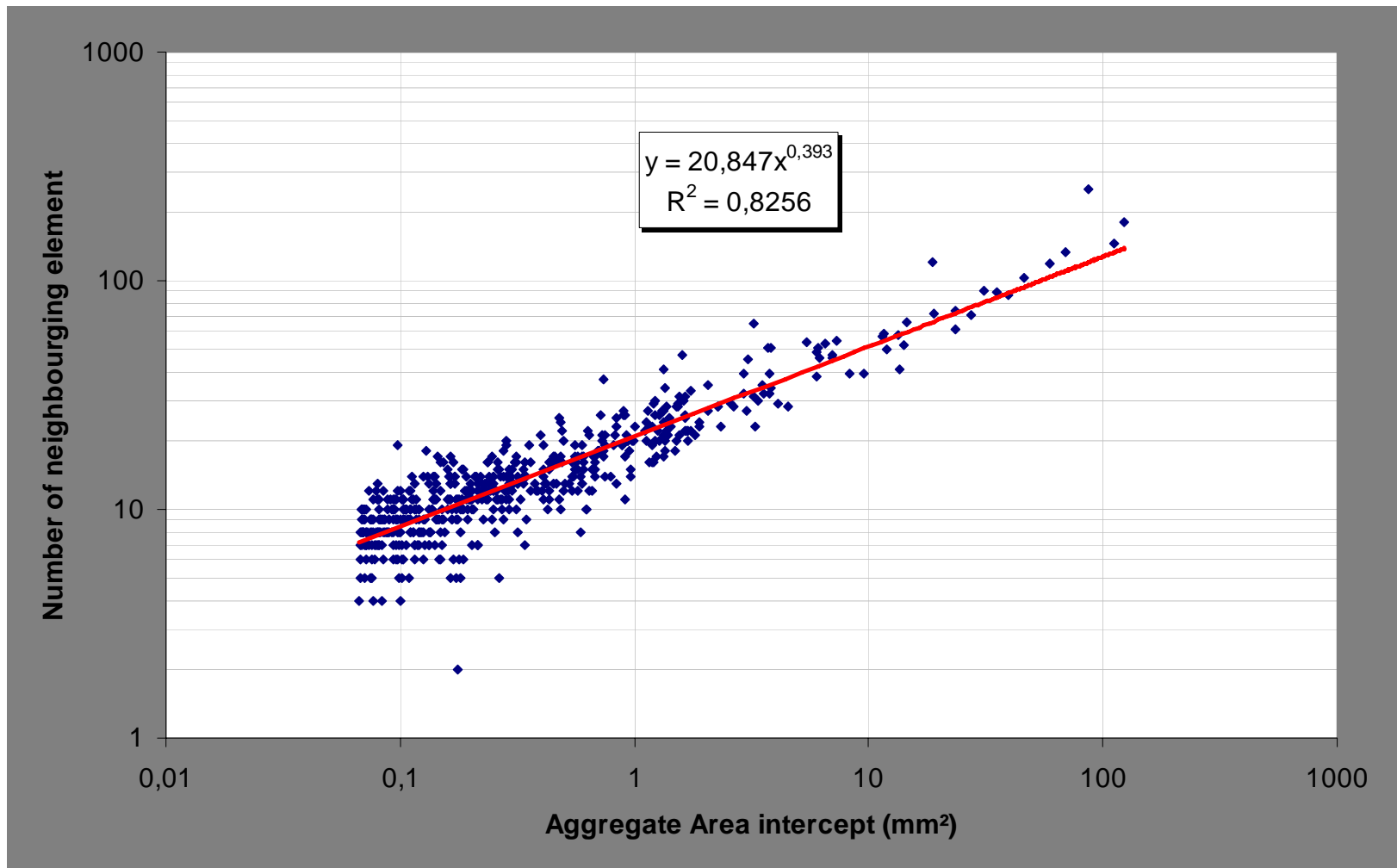
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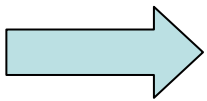


# Summary

Optical imaging 2D is a powerful tool to describe the internal structure of asphalt mixes

This approach need some requirements :

- A large raw image depending of aggregate size with high resolution
  - less than 50  $\mu\text{m}/\text{pixel}$  for grading curve
  - less than 10  $\mu\text{m}/\text{pixel}$  for mastic thickness
- Some mathematical concepts (Voronoi description, stereometry and probability, etc..)



Using tomography X ray 3D and optical imaging 2D on the same material  
To check the validity of some mathematical equations



Merci pour votre attention