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Influence of lasing parameters on the surface and morphology of Laser Induced Graphene (LIG)

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SIMPOSIO ÓMICAS 2022
Producción sostenible y seguridad alimentaria desde las ciencias ómicas

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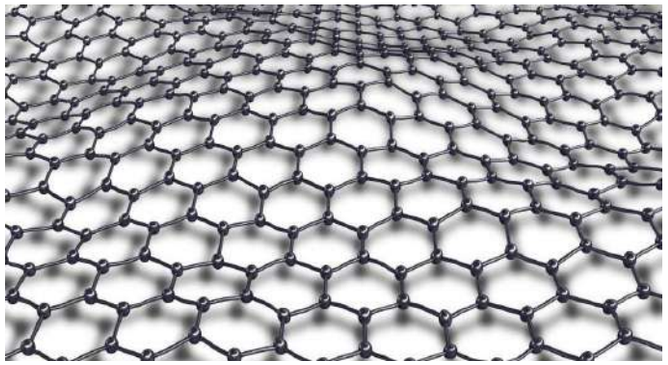
MOTIVATION



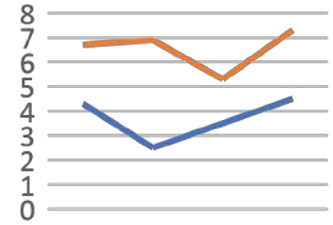
Graphene properties

- High electronic conductivity
- Good thermal stability
- High mechanical strength

Their synthesis and fabrication of graphene-based devices

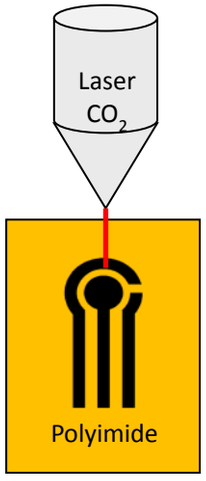
High costs

High energy consumption



Low efficiency

Laser induced graphene (LIG)



- Low costs Graphene
- Versatility
- **Sensors:**

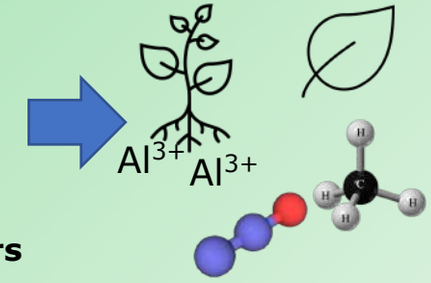
Mechanical, Thermal, magnetic, electrochemistry

Our interest… produce devices for different applications

Electrochemical sensors

Gas sensors

Capacitors



What is the influence of the spot size and passes in LIG properties?

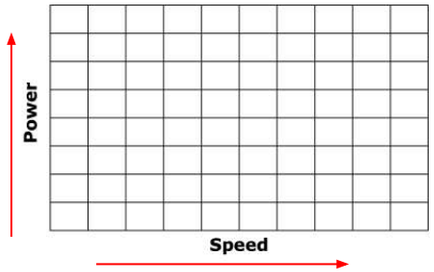
RESULTS

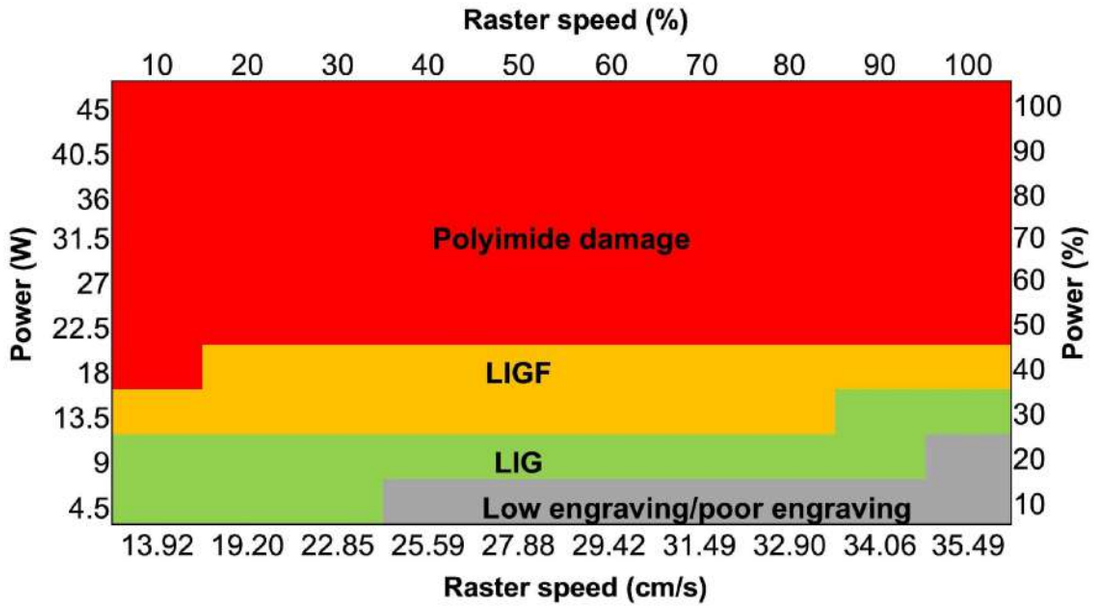
Equipment

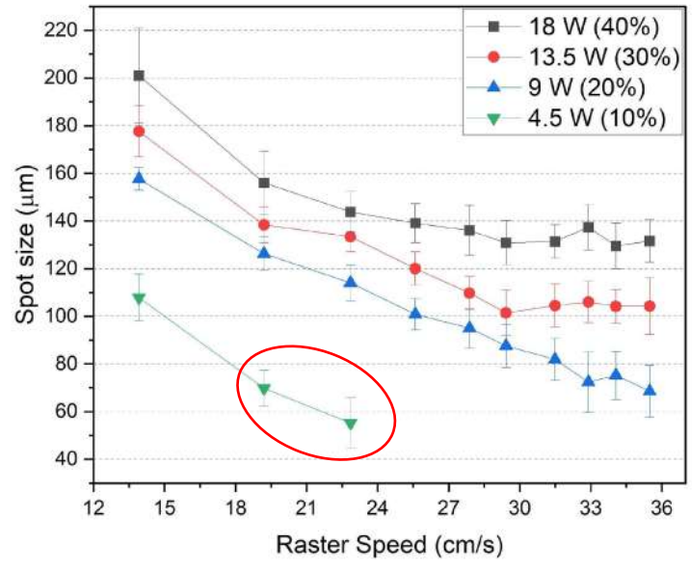
Muse 3D

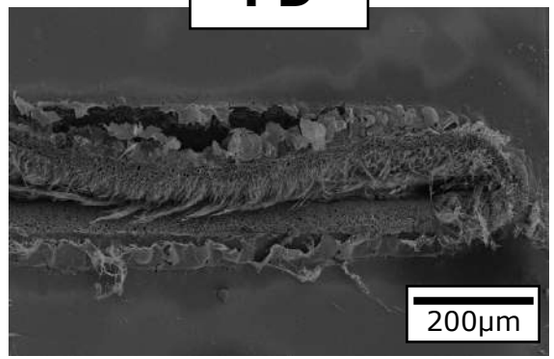
Stage 1

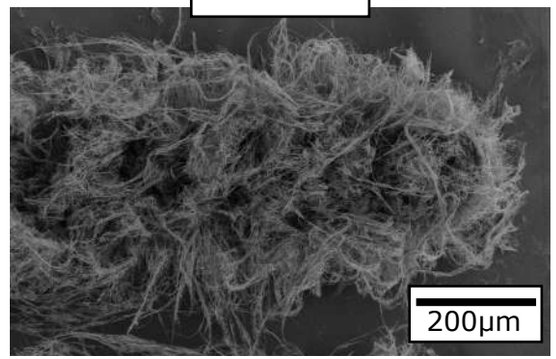
Define the experimental area

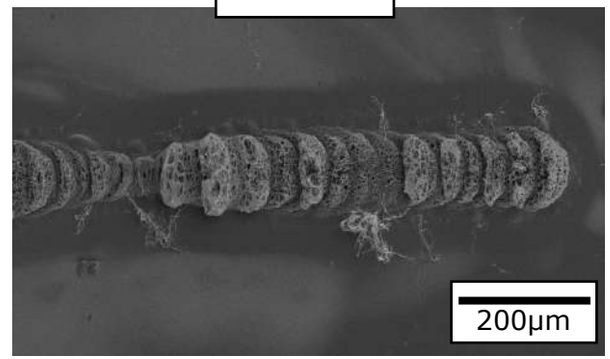




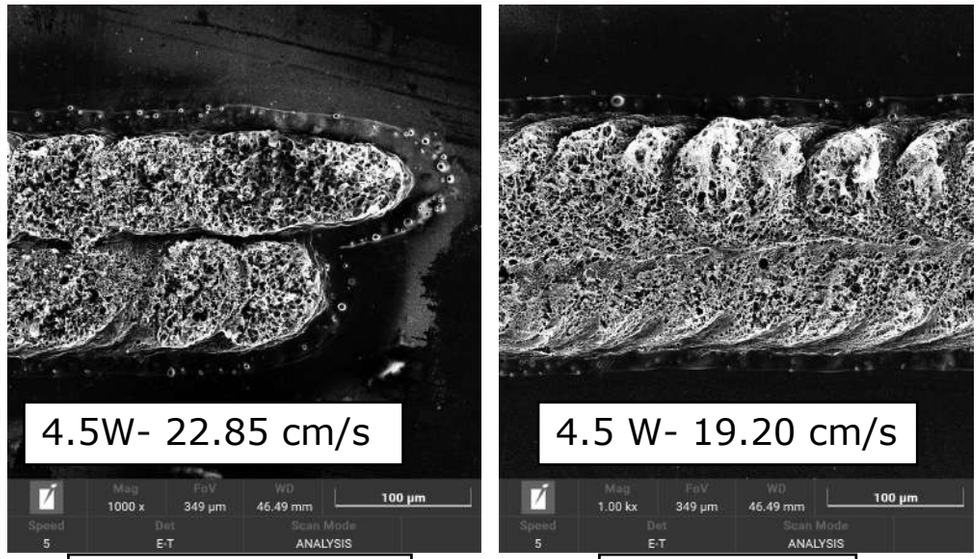


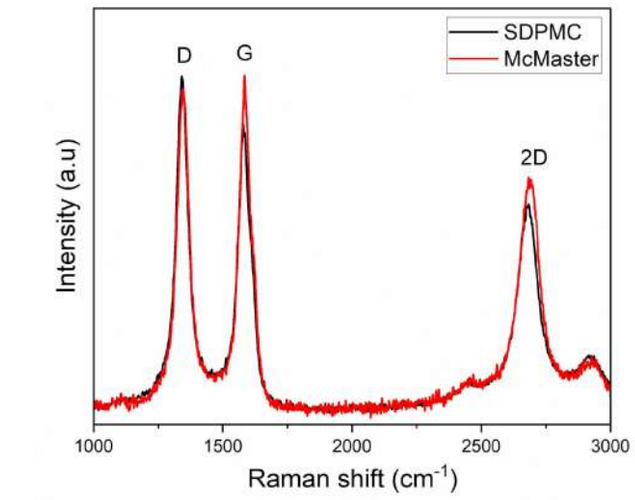


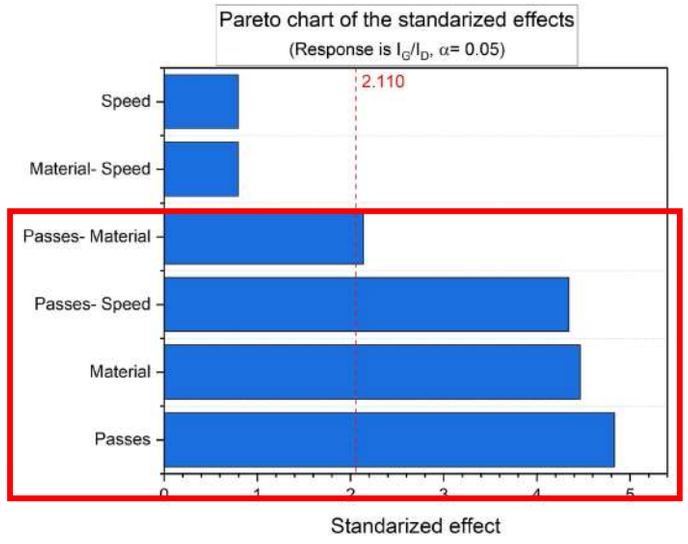


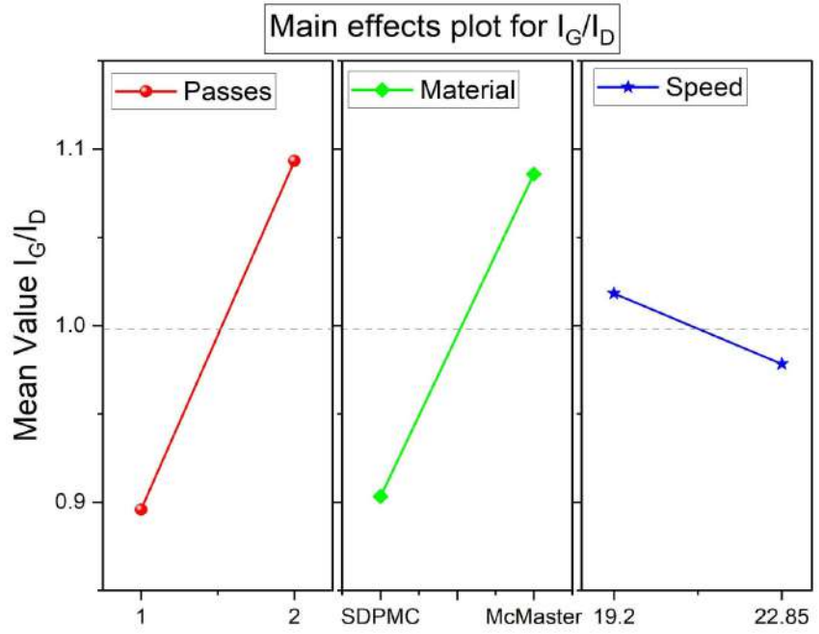


RESULTS









- Effect of the speed is related with overlapping
- Materials and passes are the main factors to produce a Good graphene

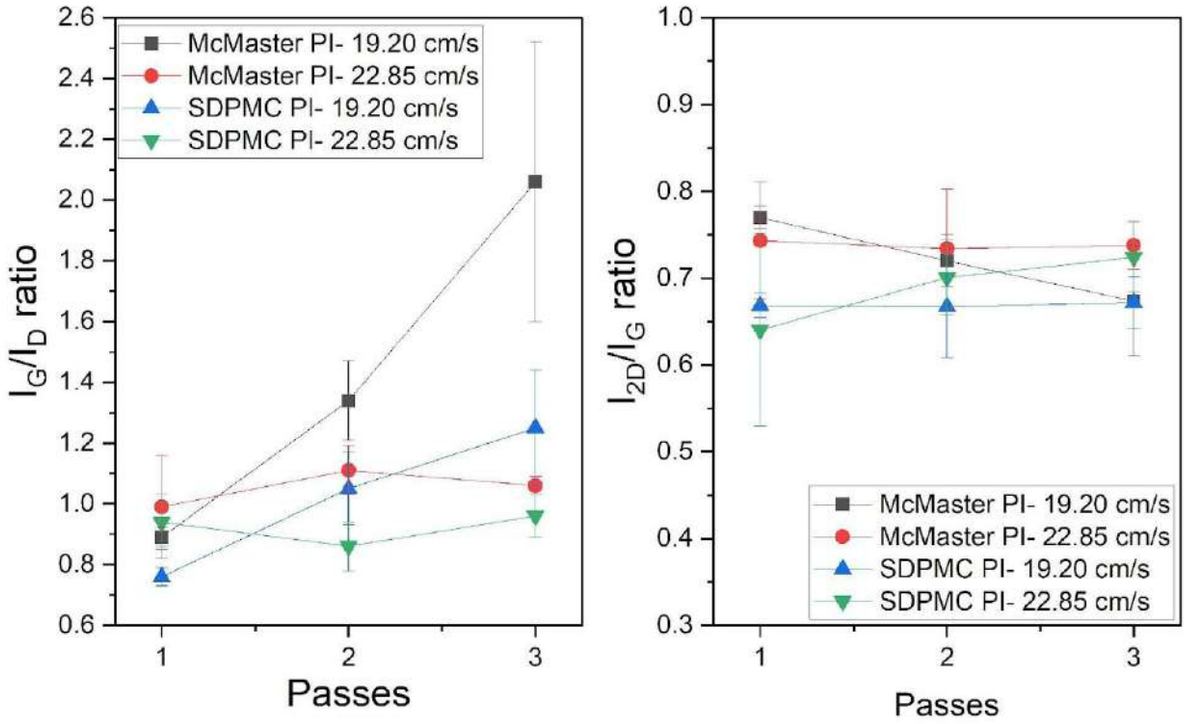
Stage 2

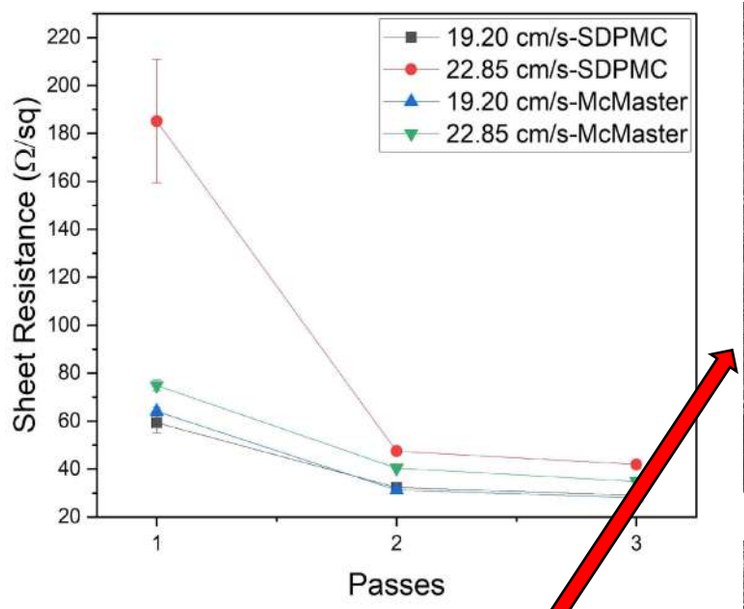
Use the DoE methodology – Factorial 2^k

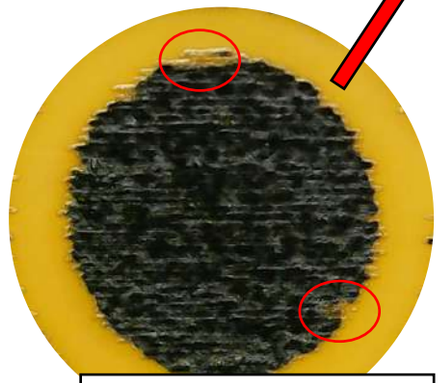
Factors
Passes= 1 and 2
PI = McMaster and SDPMC
Speed = 22.85 and 19.2 cm/s
Triplicate
Variable response: Raman I_G/I_D ratio

RESULTS

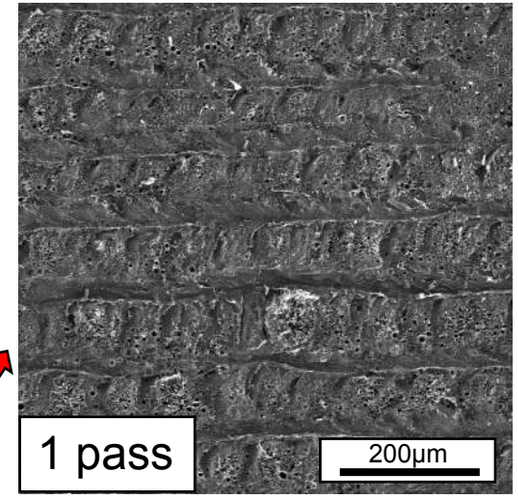
Stage 3: If we add a third pass…

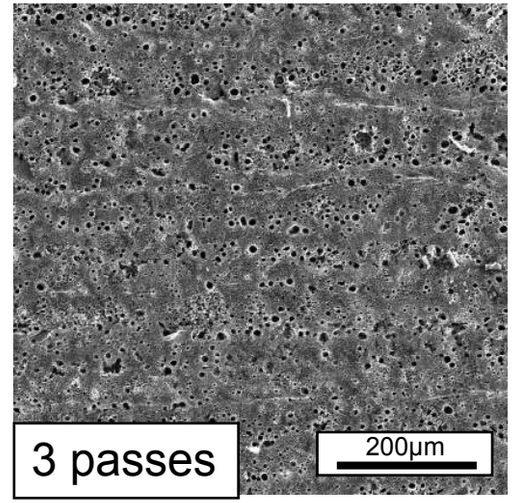




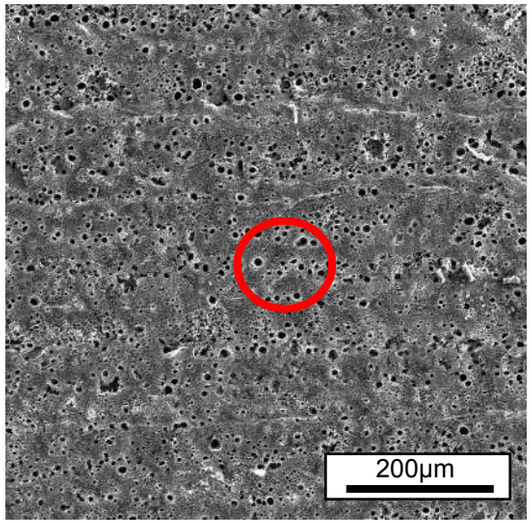


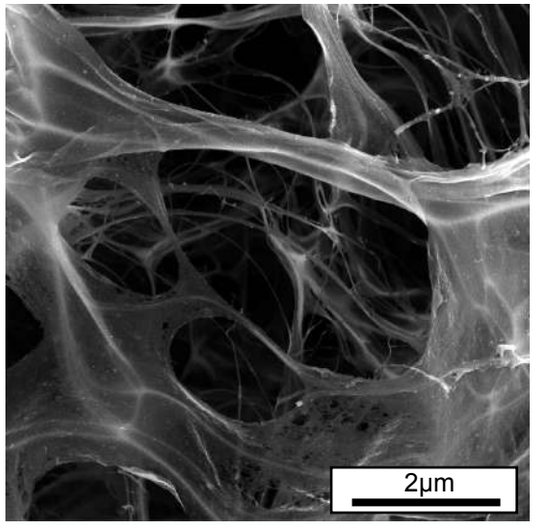
22.85 cm/s - 1 pass



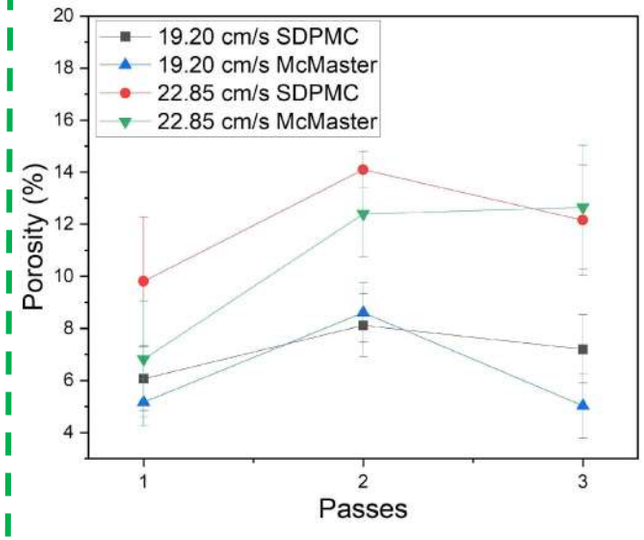


RESULTS

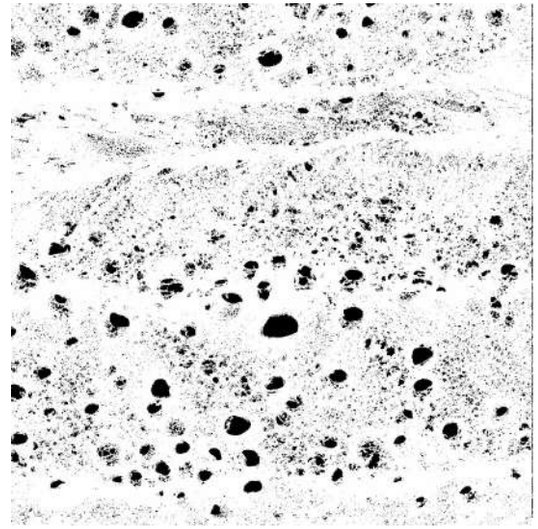


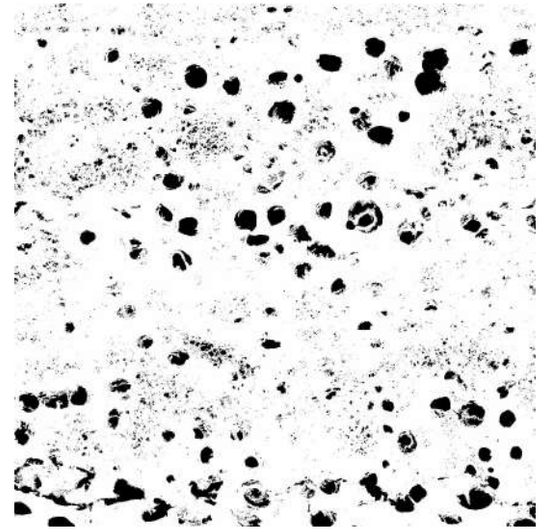


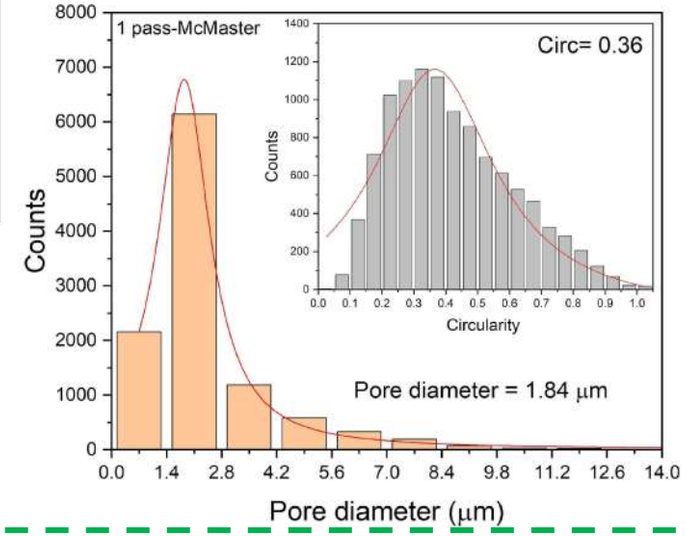
Porosity measurements
Digital image analysis with Imagej using 15 images per sample

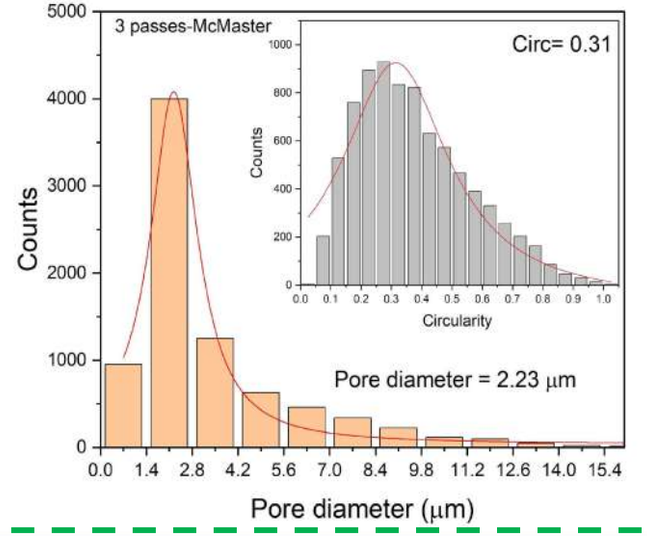


- No overlapping has an effect in porosity
- Formation of macro pores increases the value



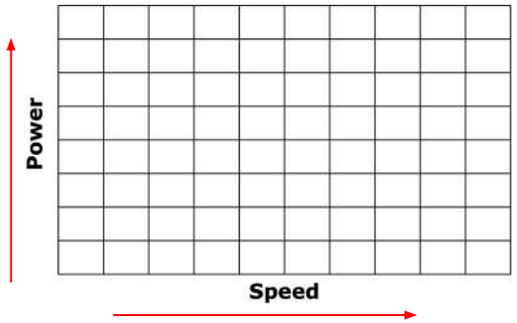


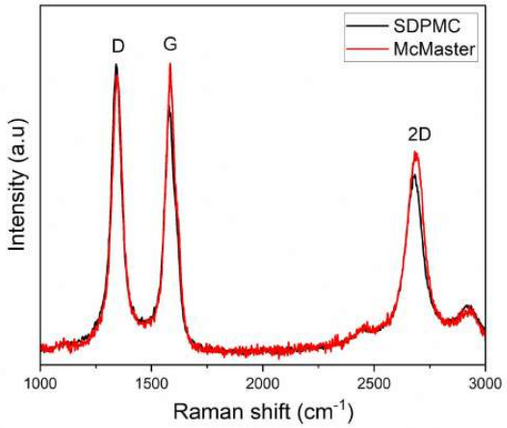




CONLUSIONS

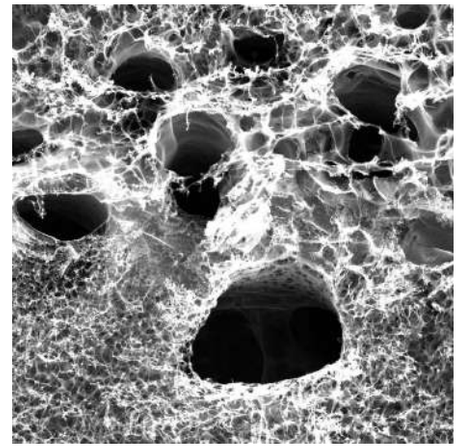
We locate engraving areas of the machine elucidating the graphene morphology and the spot size.





We demonstrate that PI brand and the number of lasing passes have a significant effect on the 3D structure of the LIG: Raman

Overlapping lasing spots during the raster engraving process has an important influence on the final characteristics of the LIG: Porosity



Prof. Andrés Jaramillo and all technical and administrative staff of the omicas program

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Aliados

Apoyan