RECENT DEVELOPMENTS IN METALLIC AND HIPE FOAM PRODUCTION WITHIN TARGET FABRICATION

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INTRODUCTION

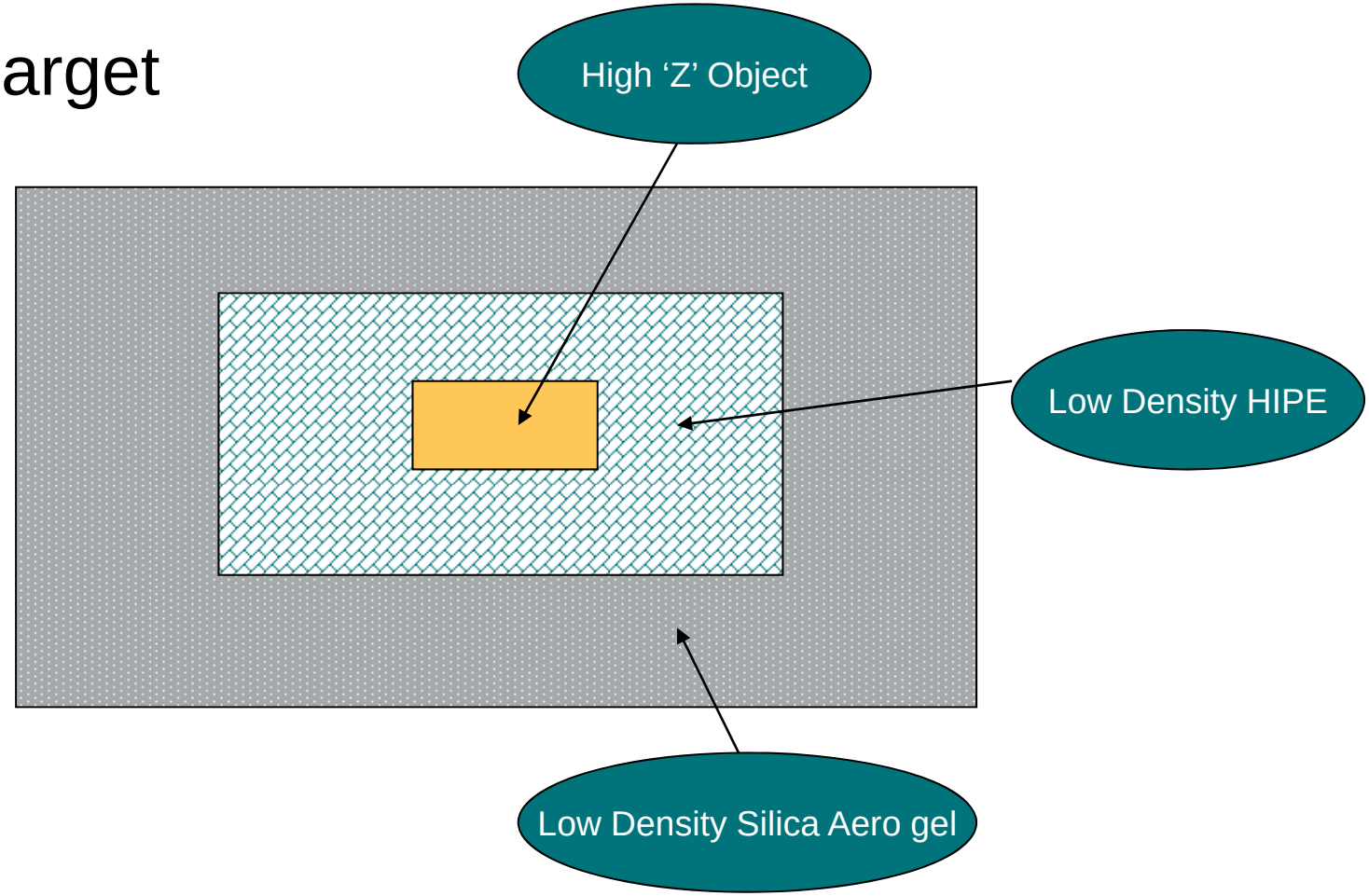
- Challenges in materials development & production *(characterisation).*
- High Energy Density Physics (HEDP) experiments
- AWE/US collaboration.

EXPERIMENT (RADIATION TRANSPORT)

- ***'Simple'*** experimental Geometry.
- Strict experimental tolerances.
- Geometry, density and material specification issues.
- Present major challenges in development, production and characterisation

TARGET (schematic)

- The Target



The Target Sub Components

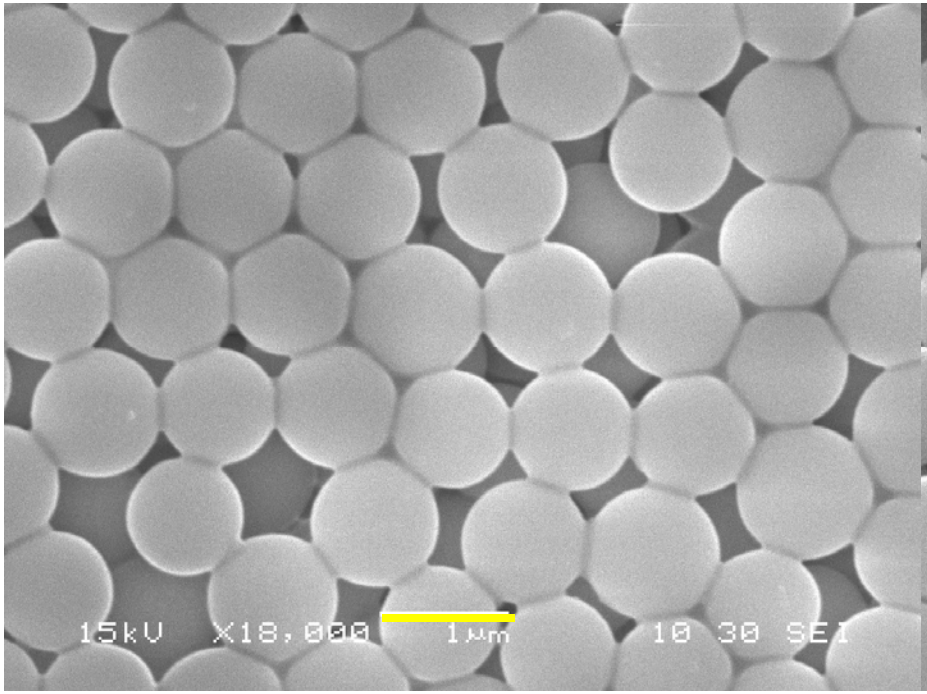
- **Inner Object:**
  - Experiment Phase 1; Gold Coated Glass Sphere.
  - **Experiment Phase 2; Metallic Copper Foam (~10%-30% TMD)**
- **Low Density Material 1:**
  - **Low Density HIPE Foam**
- **Low Density Material 2 :**
  - Silica Aerogel.

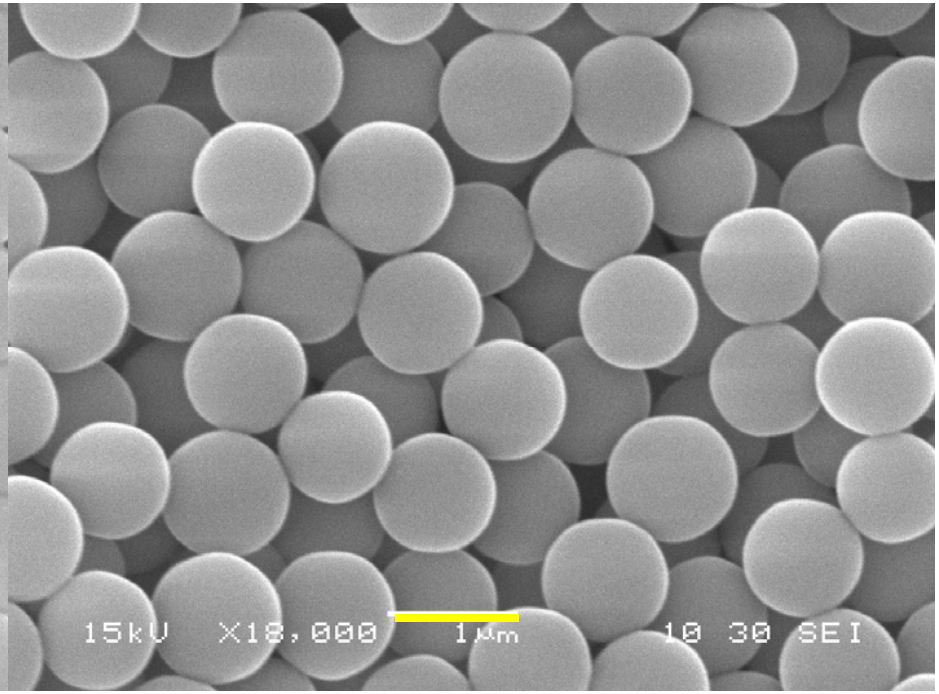
COPPER FOAM PRODUCTION

- Latex Polybead Prep.
- Electroless Copper plating.
- Slip casting, Cu Monolith production.
- Latex removal/Oxide reduction/’sintering’.

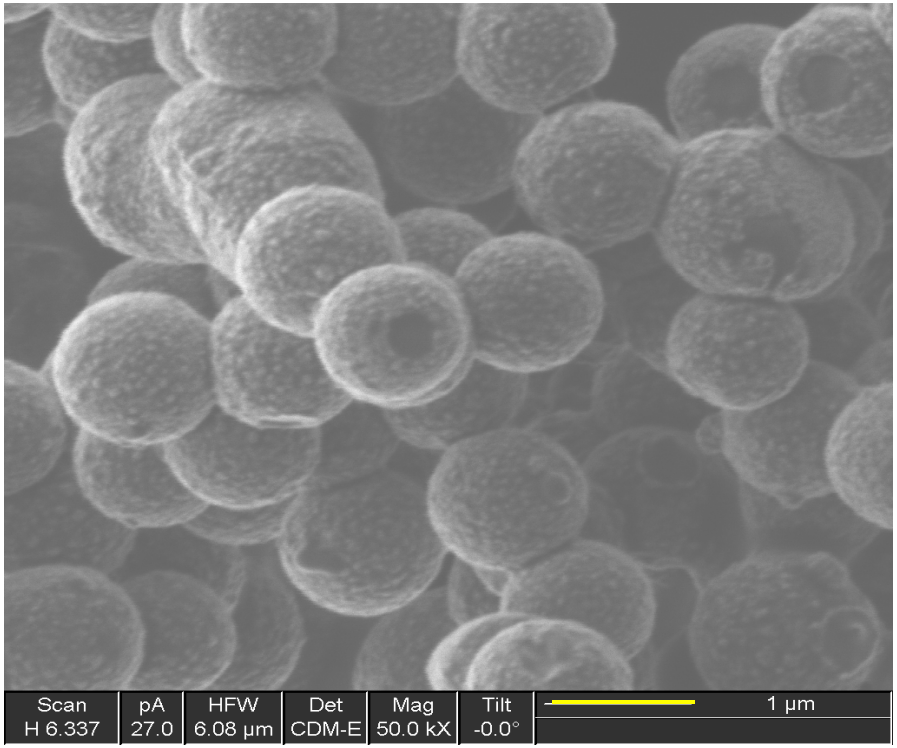
POLYBEAD PREPARATION & Cu COATING

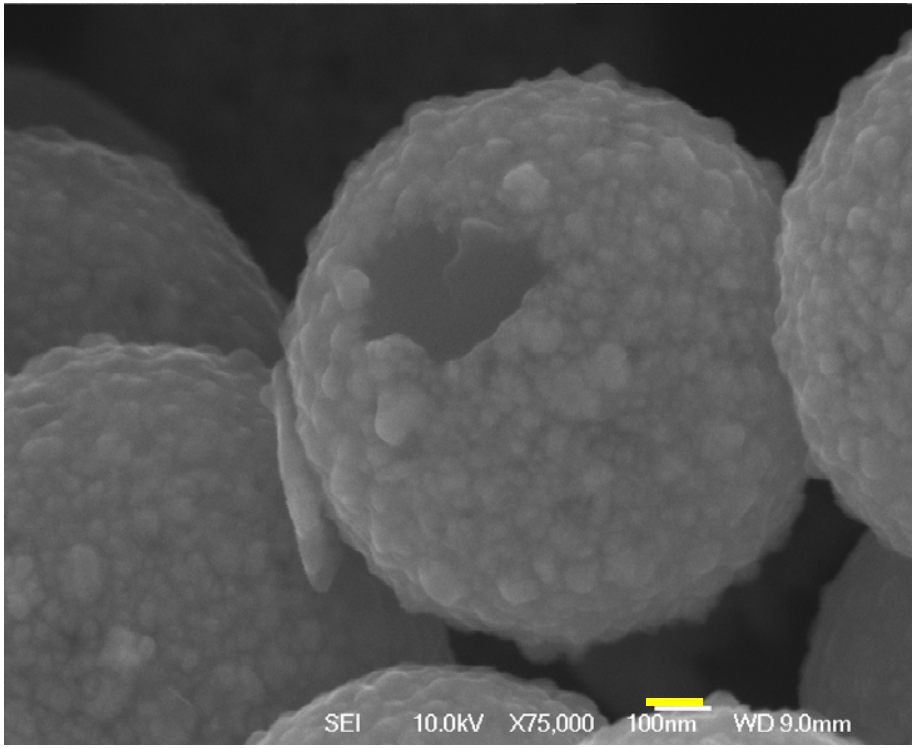
- Polybead washing



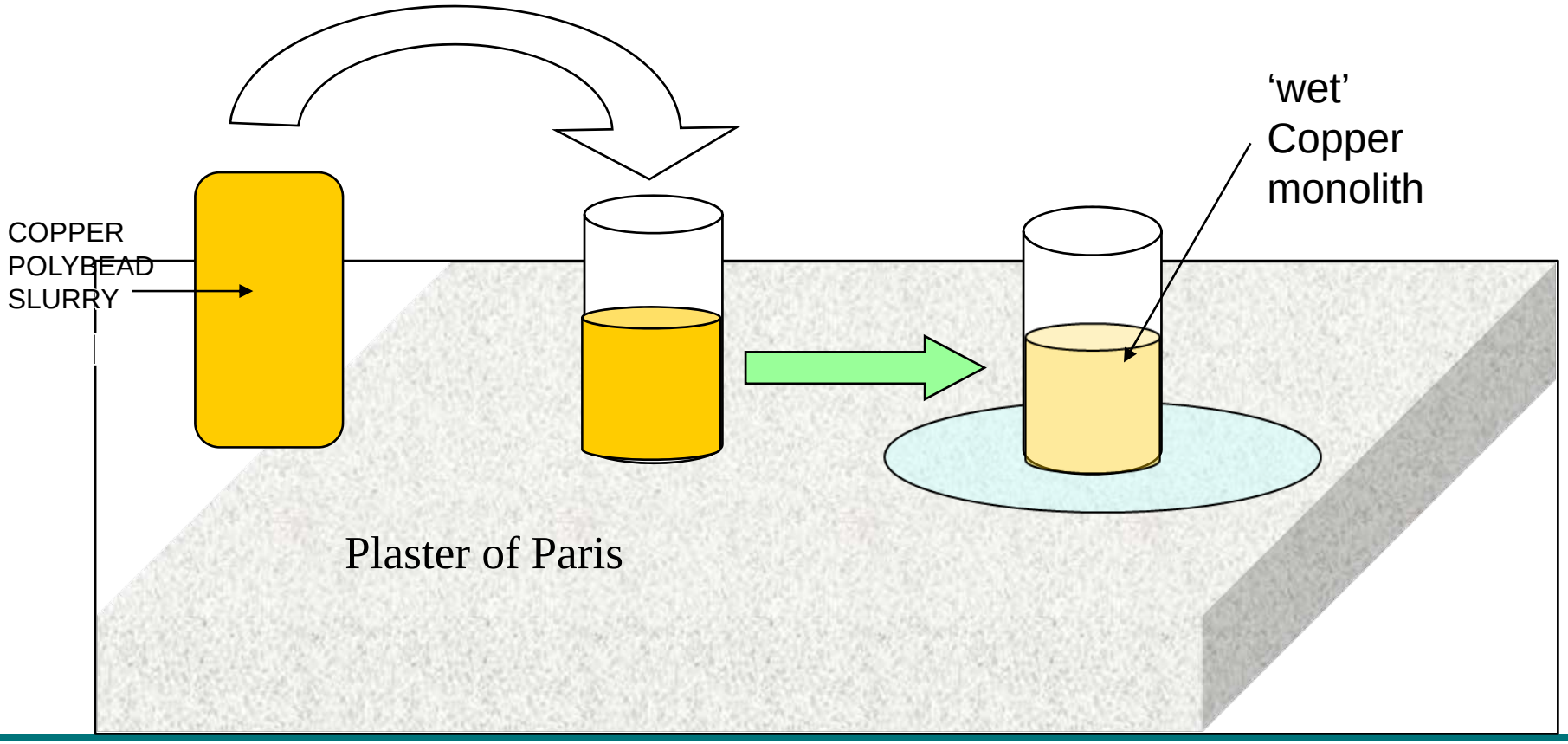


POLYBEAD COPPER PLATING

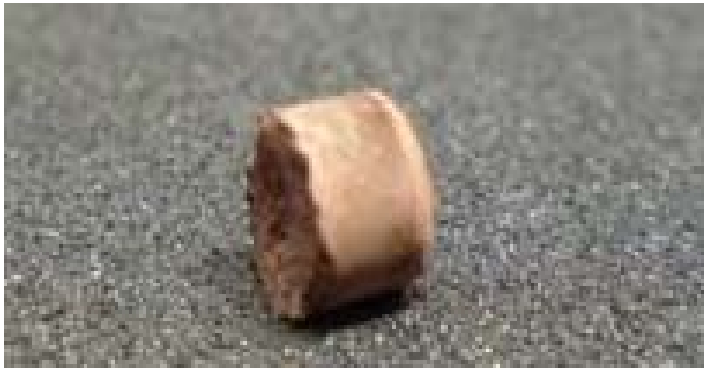




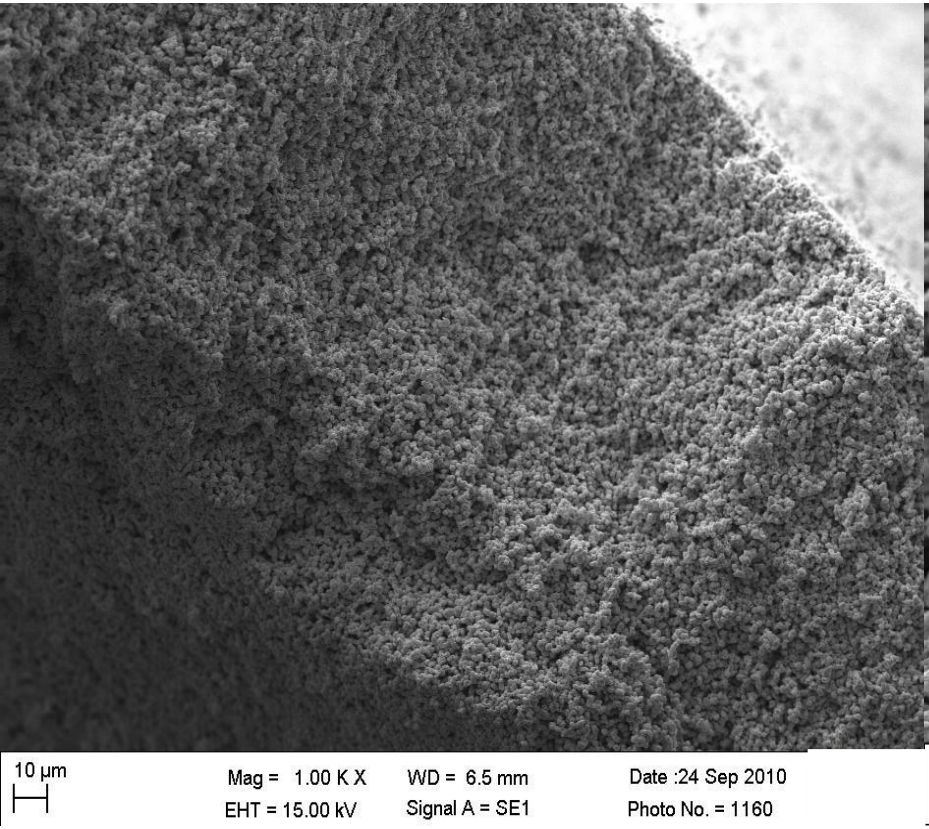
SLIP CASTING & ‘SINTERING’

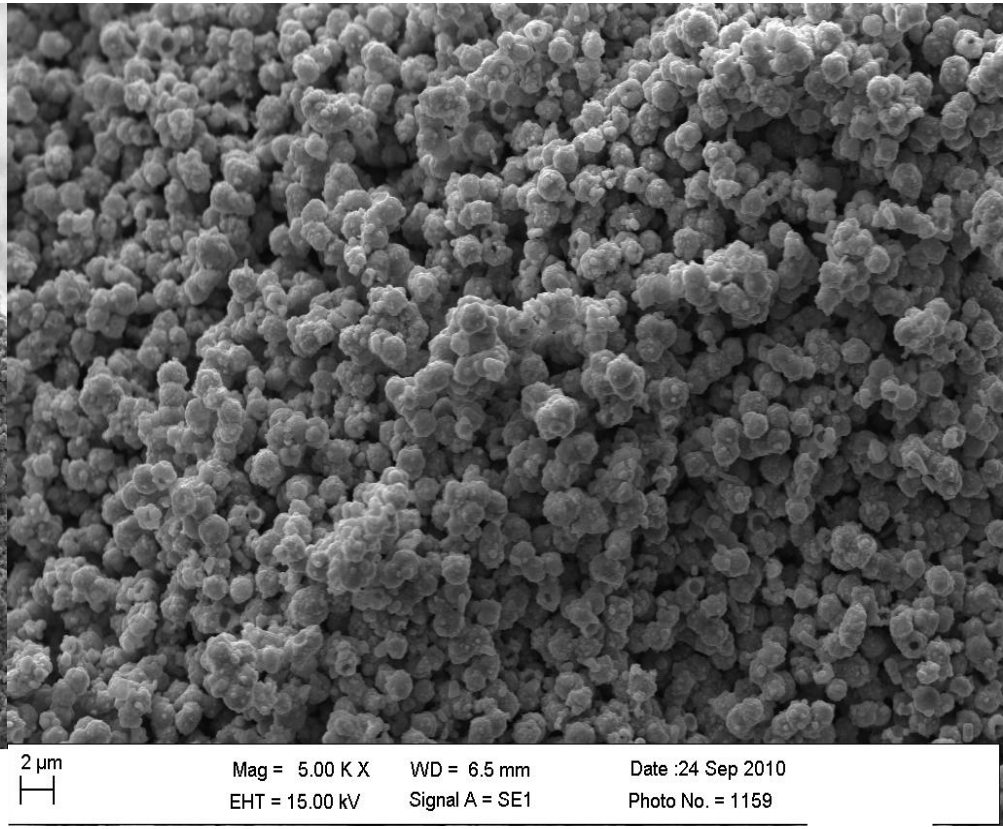


COPPER MONOLITH



COPPER FOAM


10 µm
Mag = 1.00 K X
EHT = 15.00 kV
WD = 6.5 mm
Signal A = SE1
Date :24 Sep 2010
Photo No. = 1160


2 µm
Mag = 5.00 K X
EHT = 15.00 kV
WD = 6.5 mm
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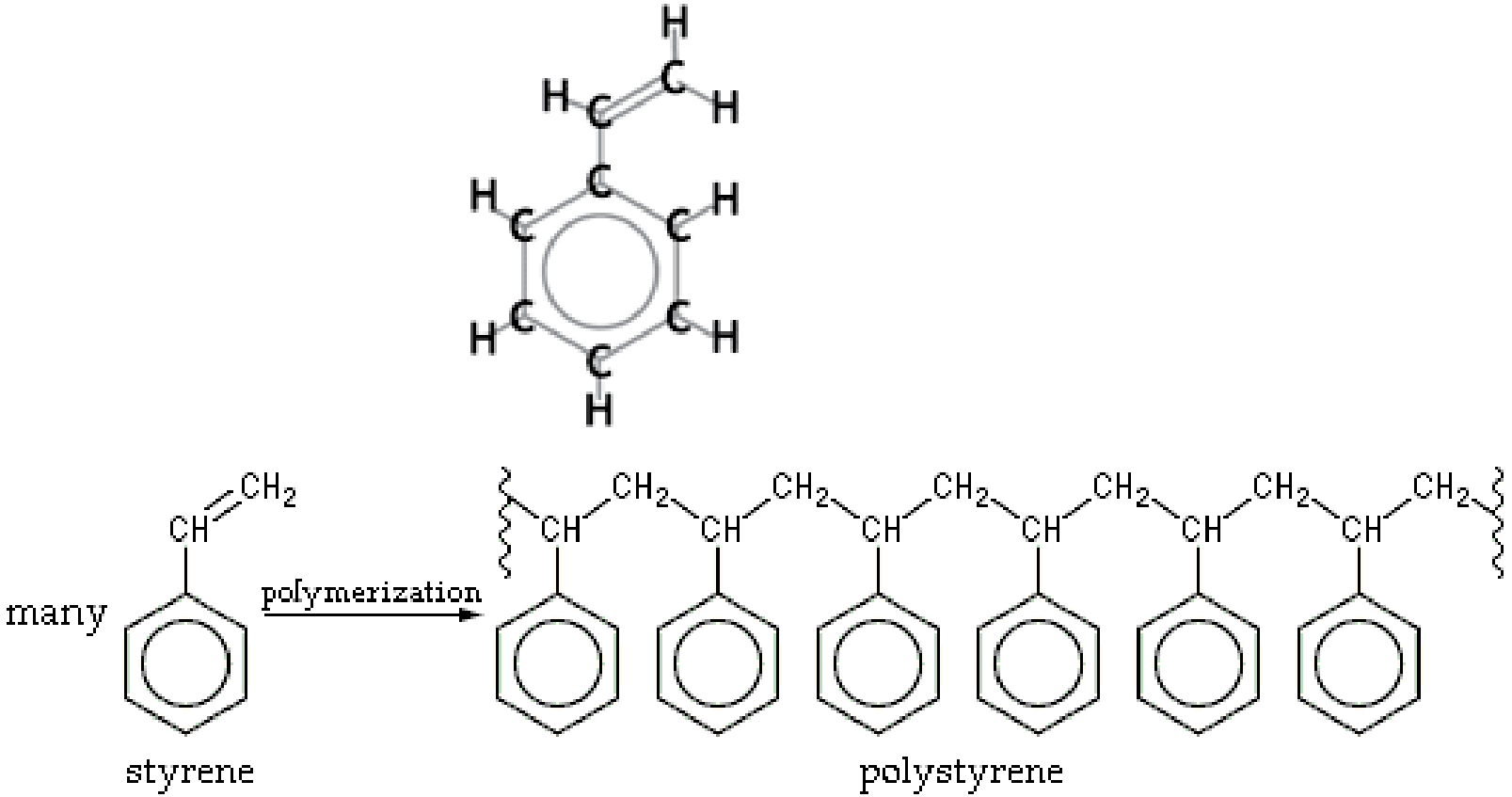
Date :24 Sep 2010
Photo No. = 1159

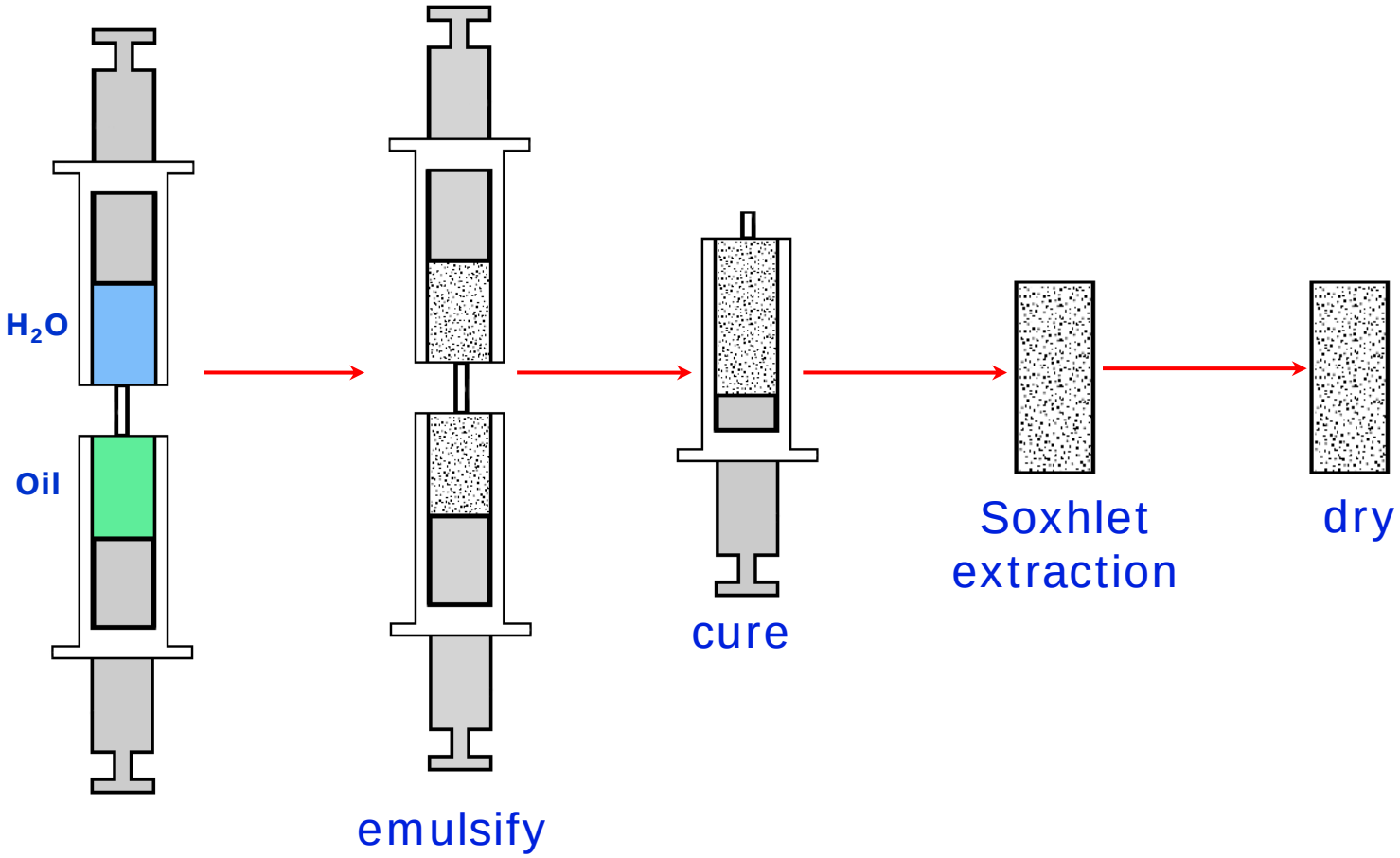
HIPE FOAM DEVELOPMENT (High Internal Phase Emulsion)

- The dispersion of one immiscible liquid (internal phase) inside another (continuous phase).
- Stabilised by a surfactant.
- By definition HIPE is an emulsion with greater than 70% internal phase and up to much as 95% internal phase, therefore the stability issue is very important.
- Polymerised by Thermal Initiation

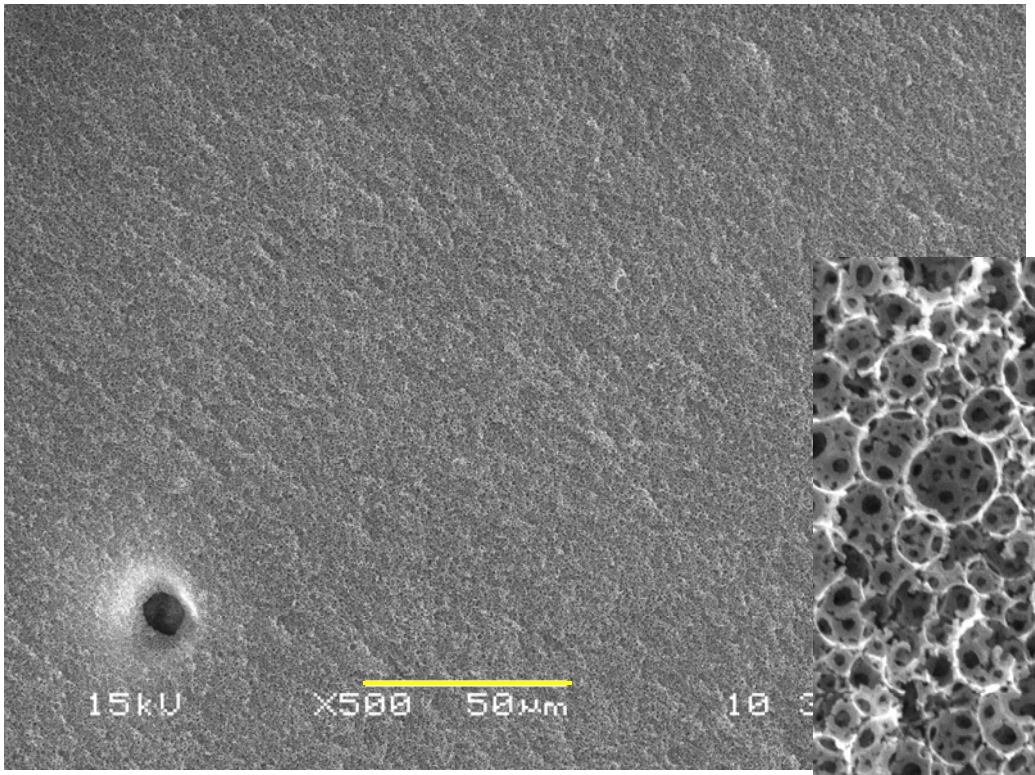
CONTINUOUS PHASE (OIL/MONOMER)

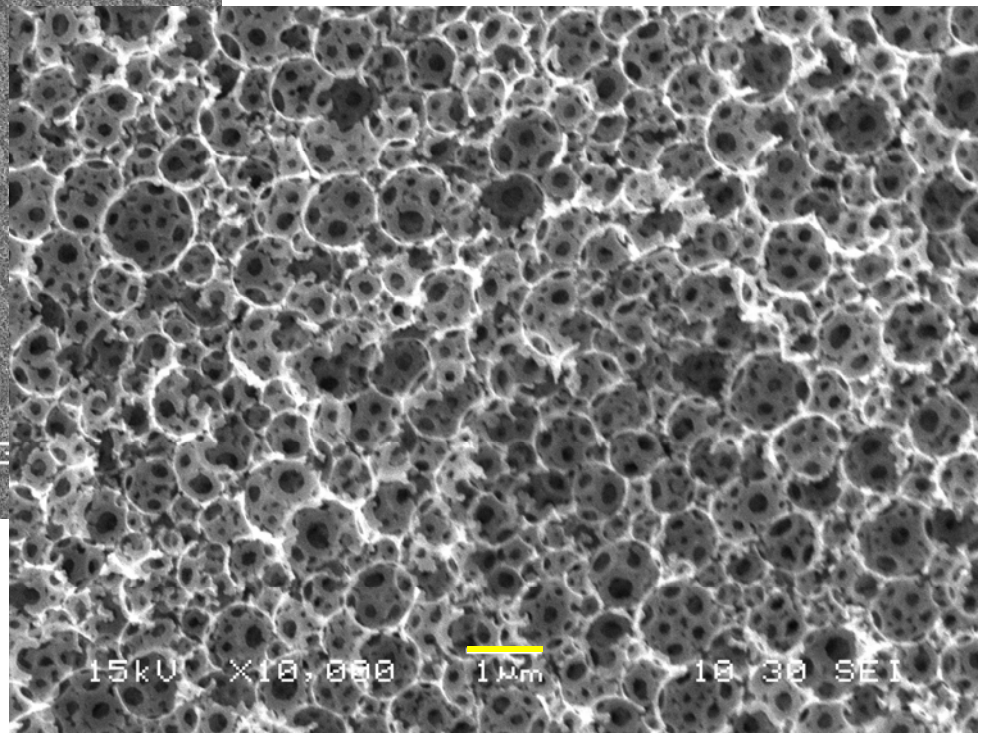


SYRINGE HIPE METHOD (Schematic)

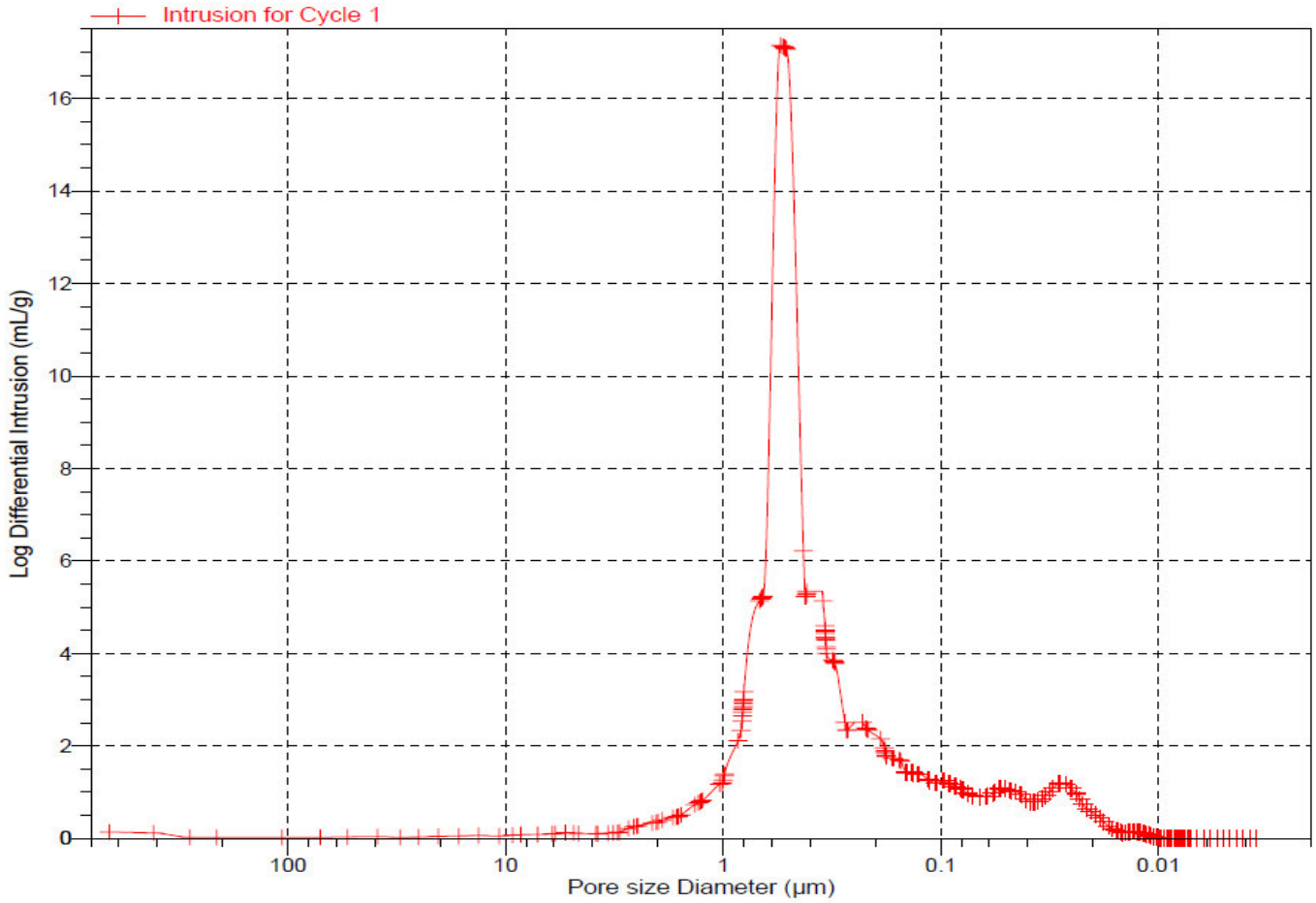


RESULTS

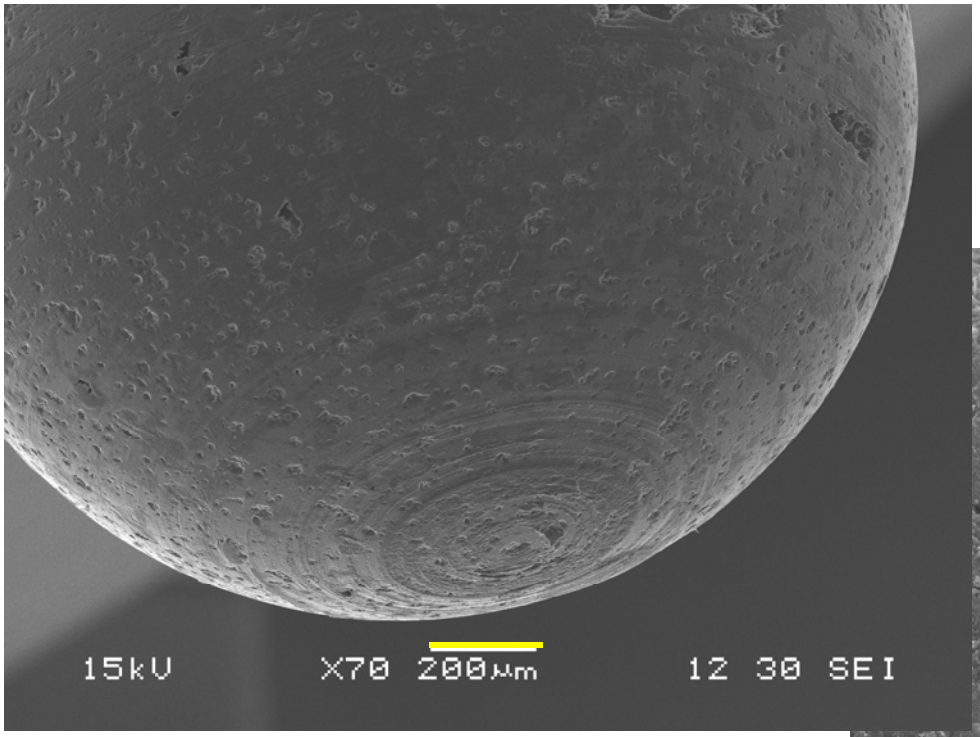


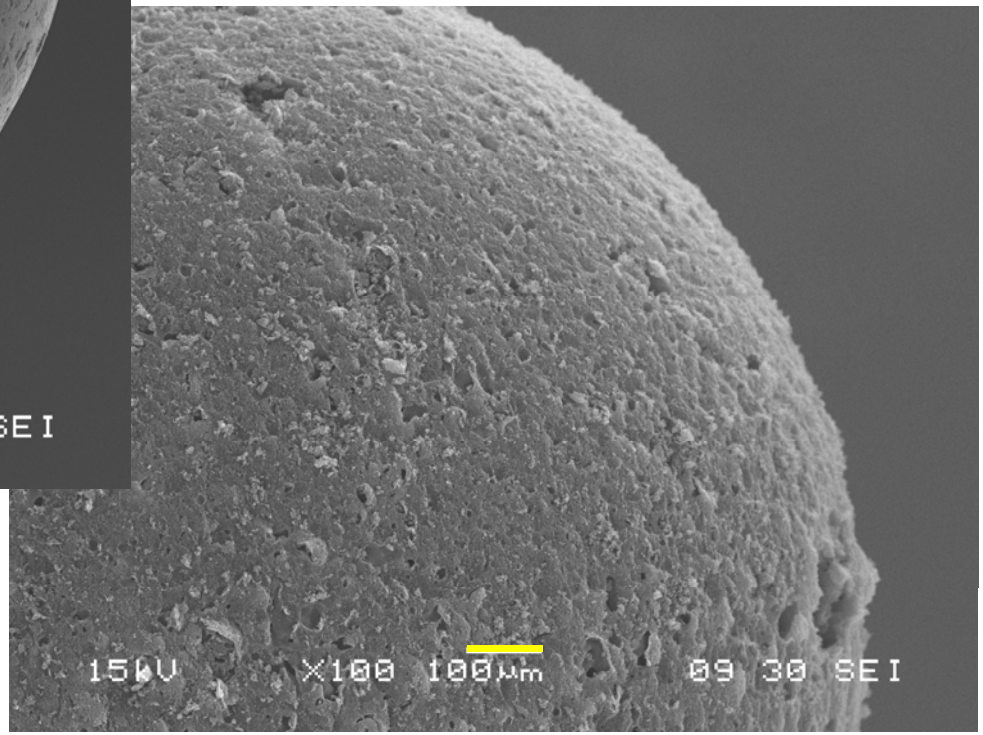


MERCURY POROSIMITRY



MACHINEING TRIALS





SUMMARY

- Proven Metallic Foam technique
- Other metals
- Multi Density Range HIPE
- Halogenated HIPE

QUESTIONS