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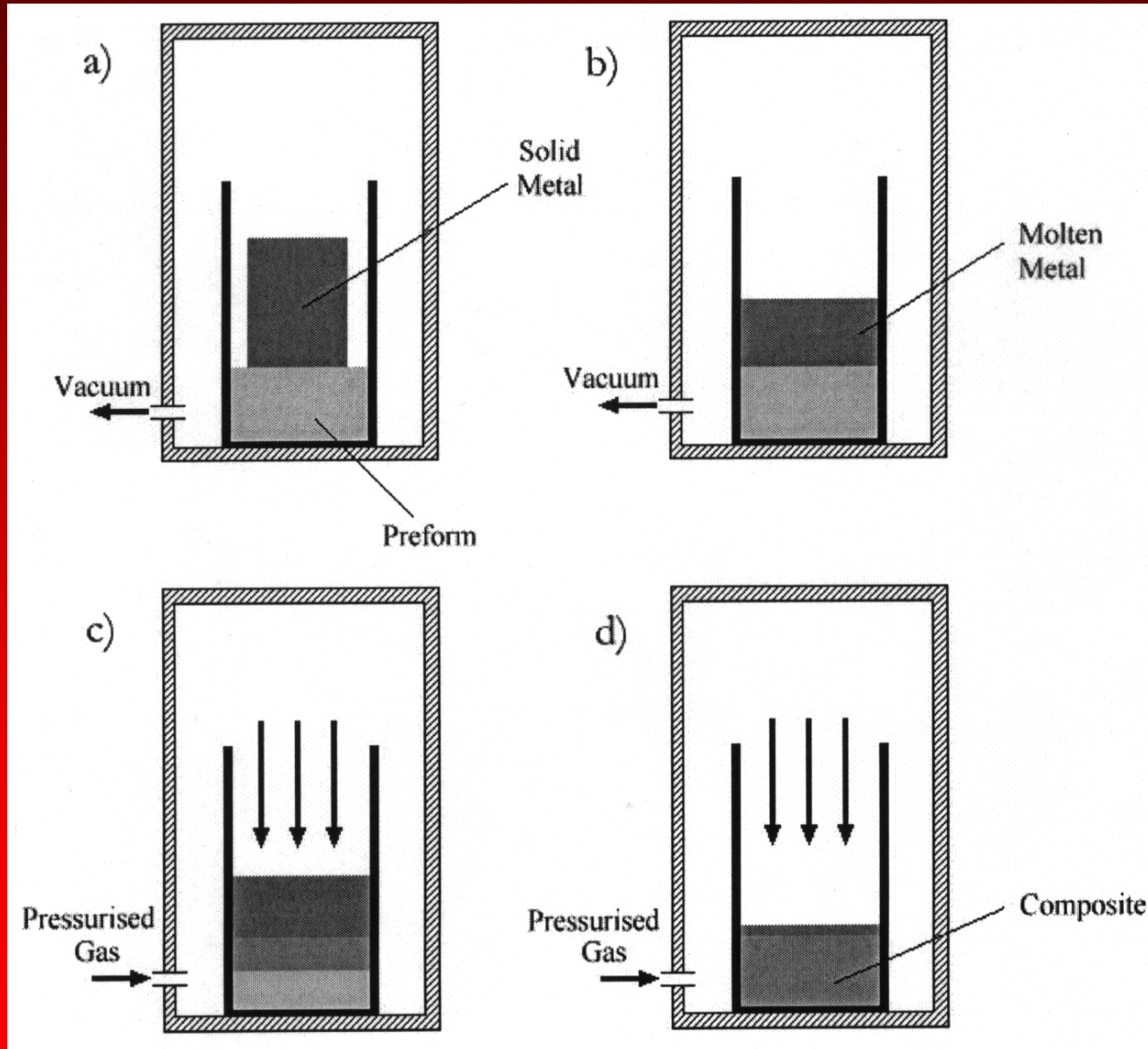
ÉCOLE POLYTECHNIQUE
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Diamond based Composites for Collimators

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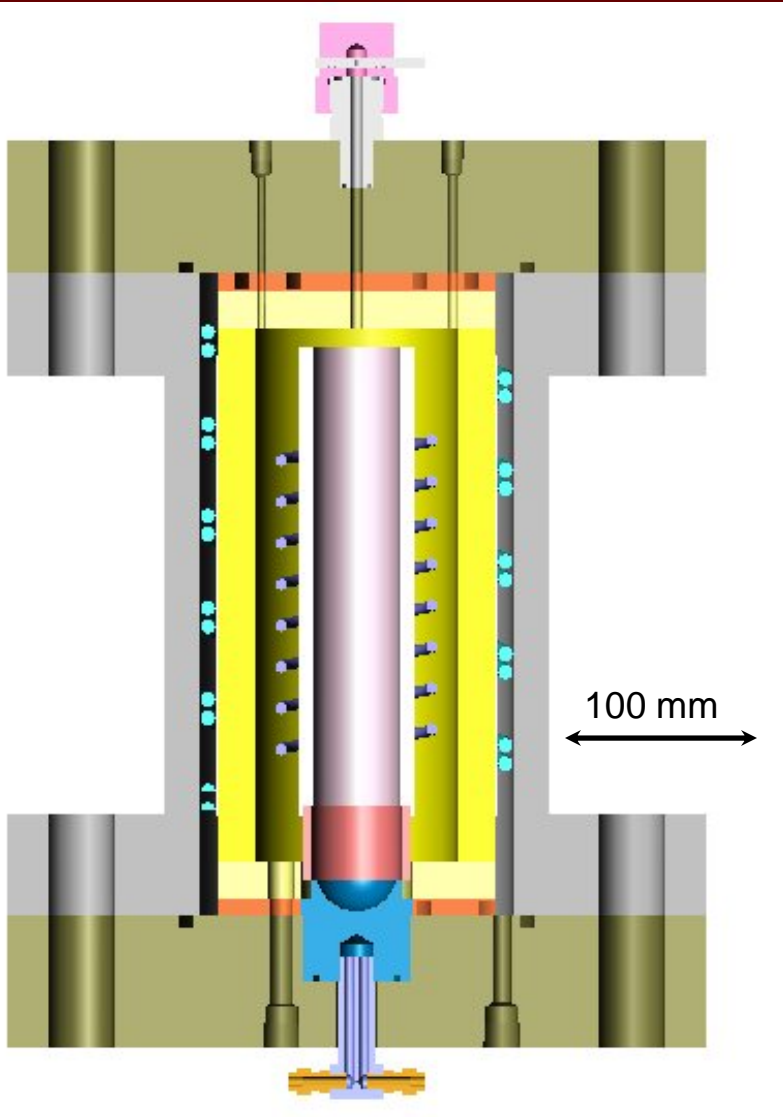
Liquid metal infiltration process



Alternative routes:

- hot pressing of powder mixtures
- hot pressing of coated particles

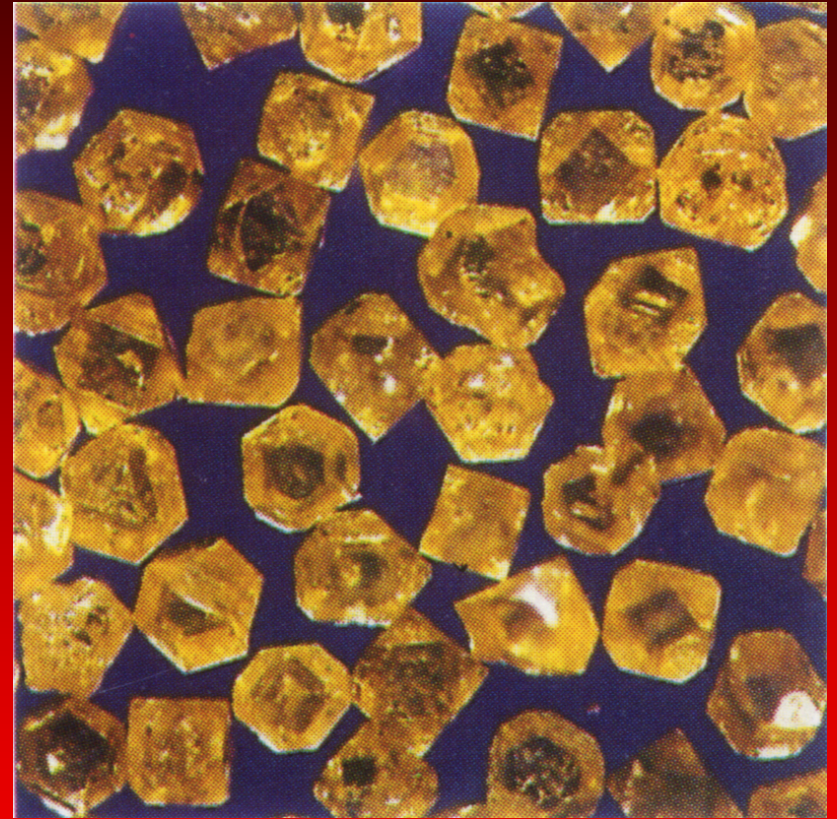
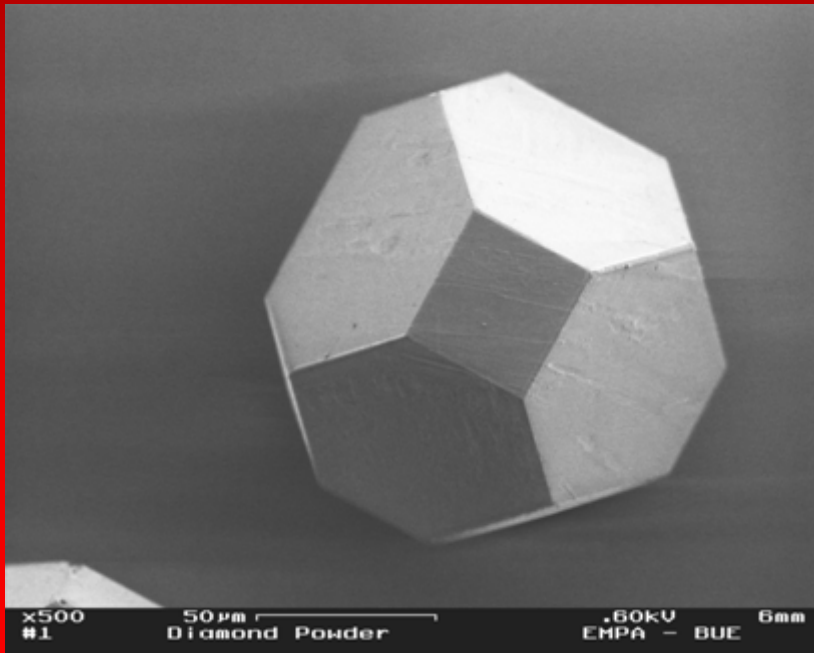
Pressure infiltration apparatus



- **Cold wall vessel** (250 bar, 200°C)
Inner side of the wall in contact with a water cooled heat shield
- **Induction heating**
(using a graphite susceptor)
- **primary vacuum pump**
(0.1 mbar)
- **Crucible can be lowered on quench** (directional solidification)

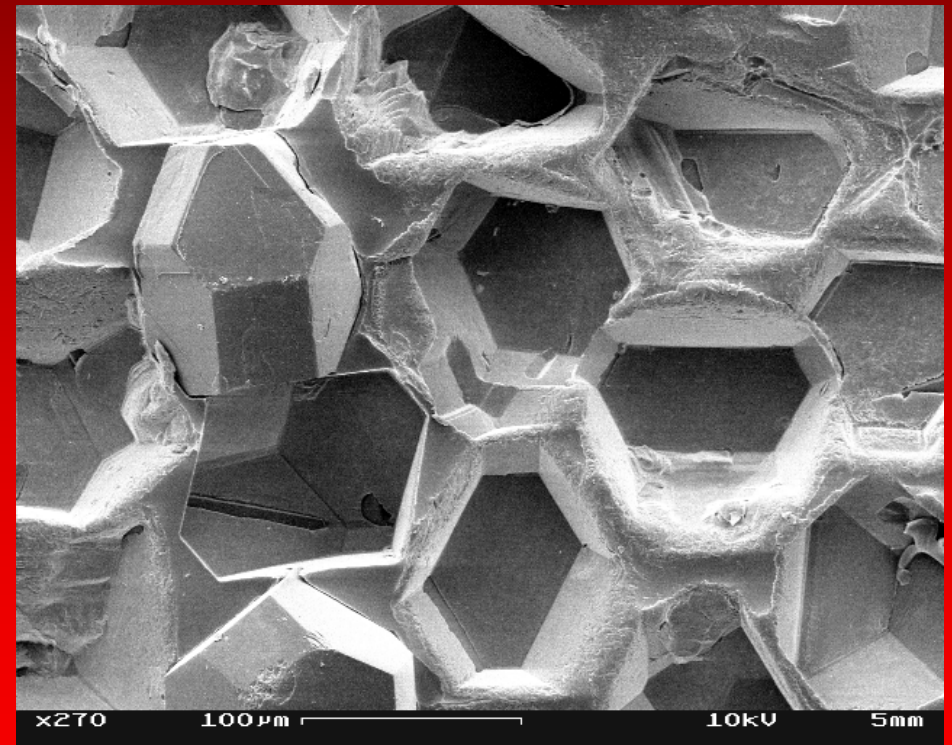
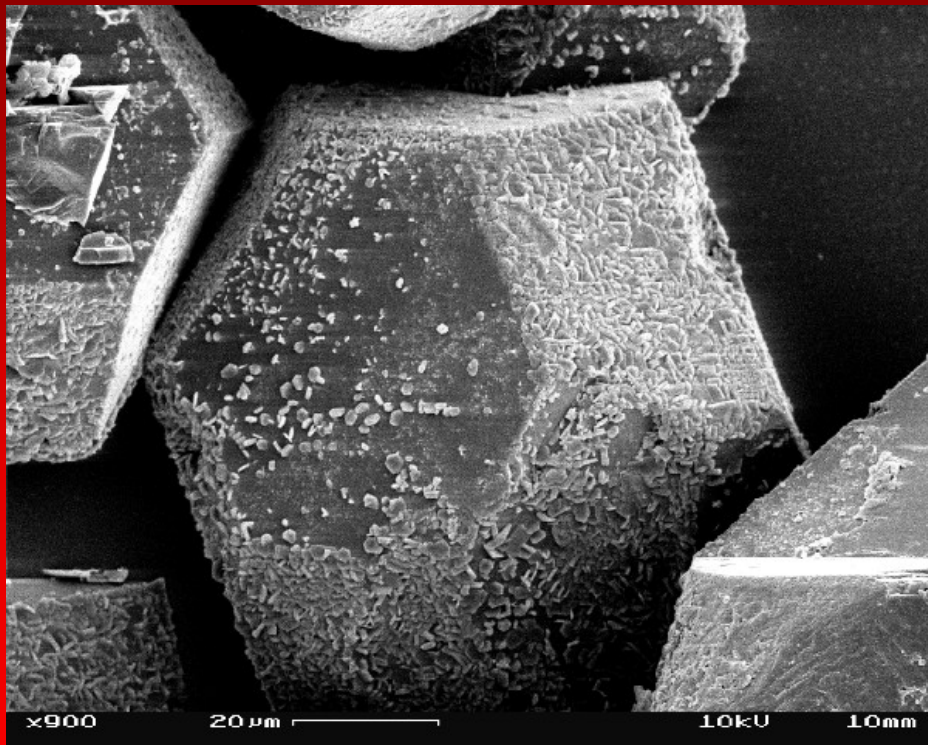
Selected diamond grit

- Mono-crystalline diamond
- Low nitrogen level
- Relatively large size ($>100\mu\text{m}$)



Interface study of Al-Diamond composites

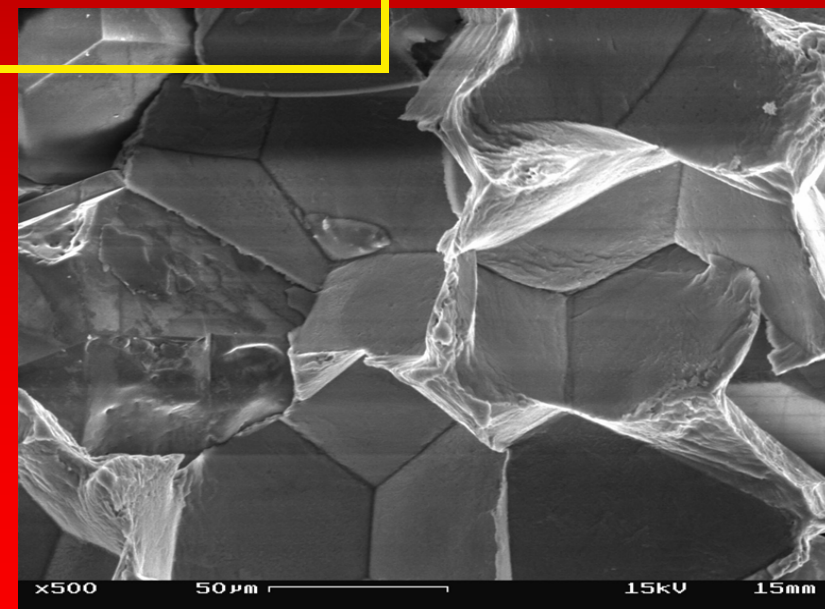
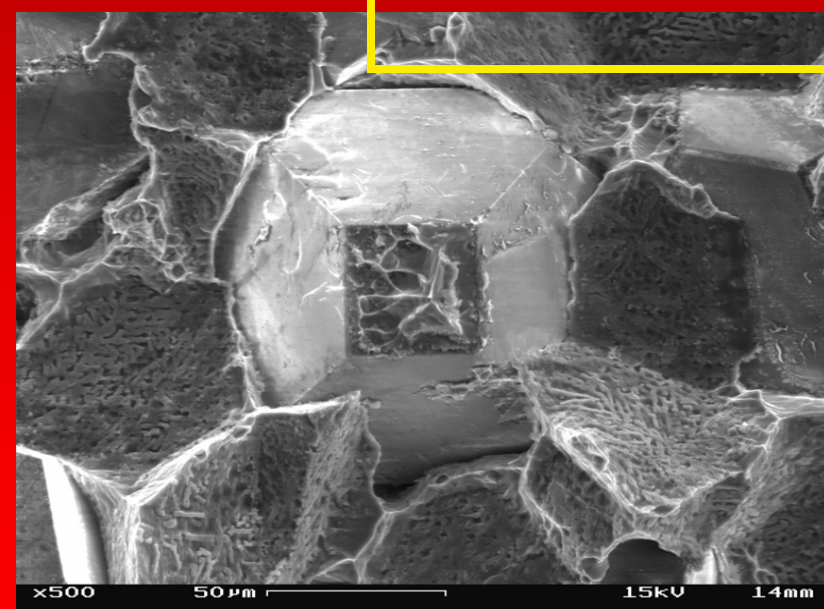
Comparison of GPI and Squeeze Casting



Interface study of Al-Diamond composites

Comparison of GPI and Squeeze Casting

	GPI	SC
Thermal conductivity	660	110
CTE	8-10	17-25



Critical issues

- Diamond particle size: the larger the better the TC
- Limited machinability => Need for net-shape solutions
- Size of the net-shape parts
- Radiation damage in Diamonds
- Electrical conductivity rather low (5-10 MS/m)