



# Joining of C/SiC for aerospace applications



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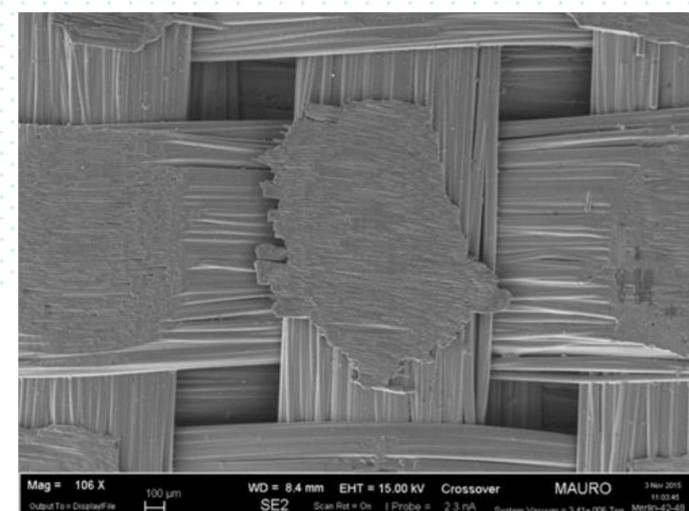
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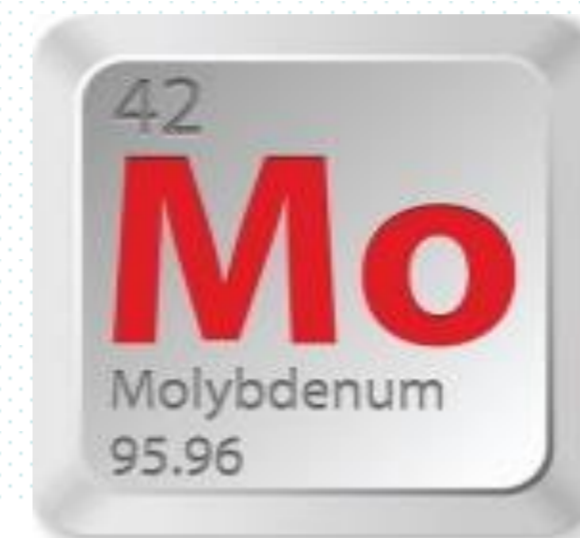
**Aim: To join C/SiC to C/SiC with a new, pressure-less composite joining material and technique, for high performance applications**

## The Idea

Silicon viscosity is very low at its melting temperature .... and C/SiC are porous....

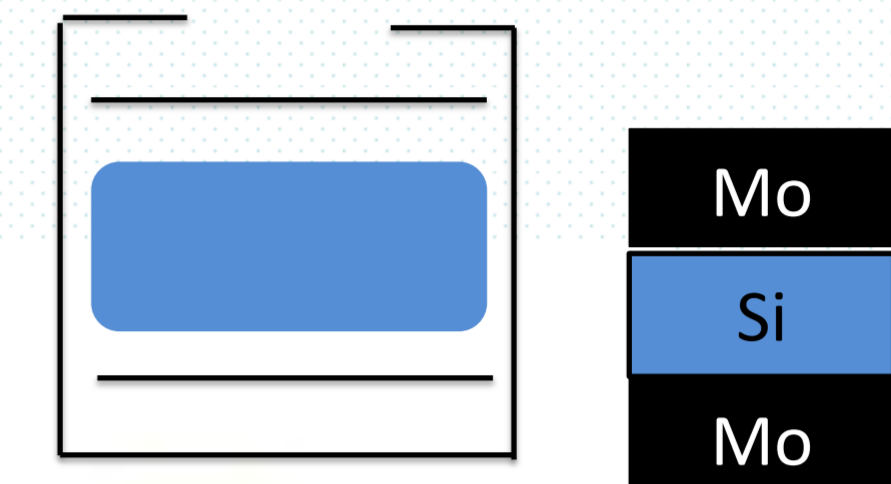


What if we add another element to reduce Si content ?

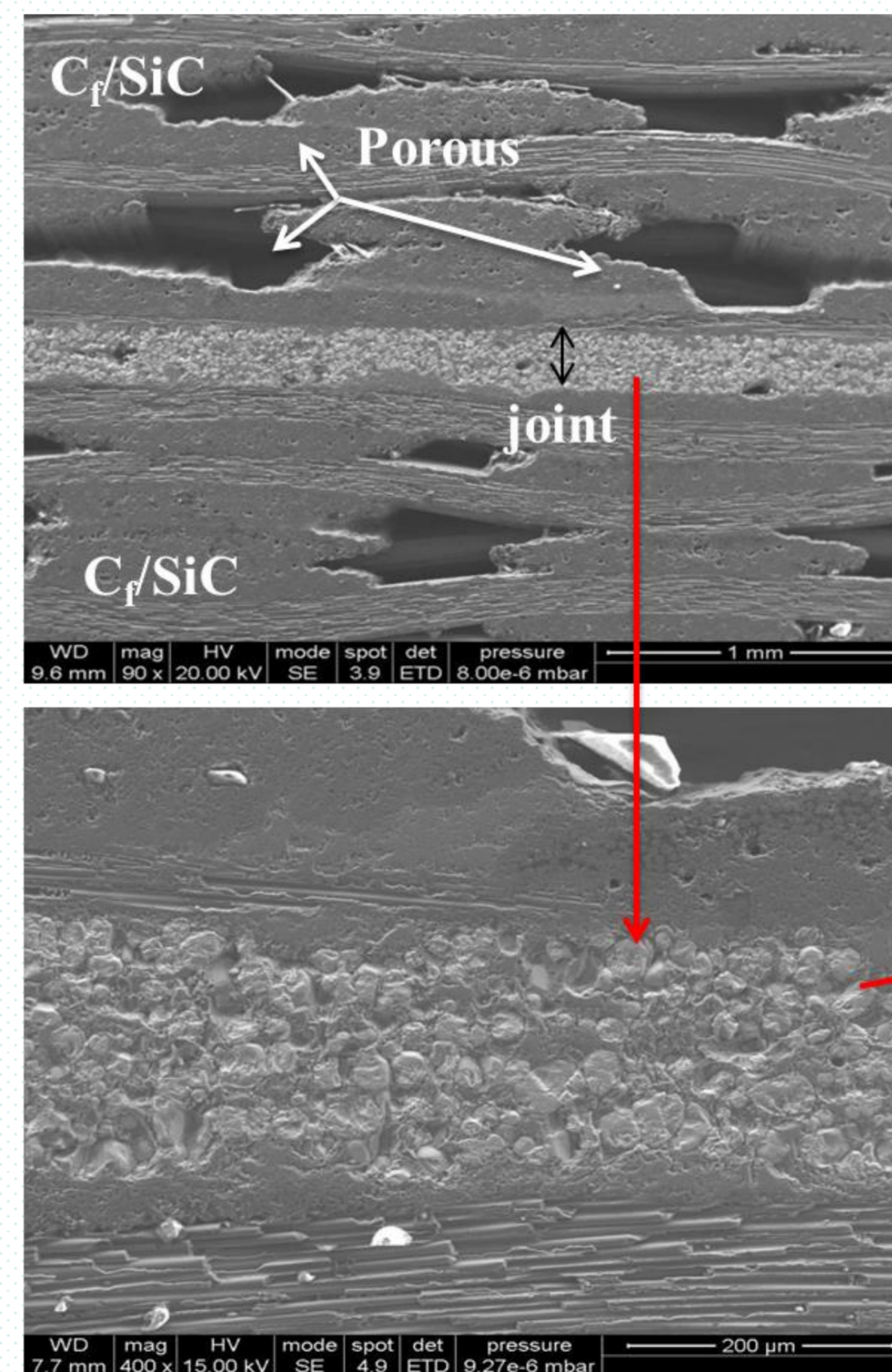
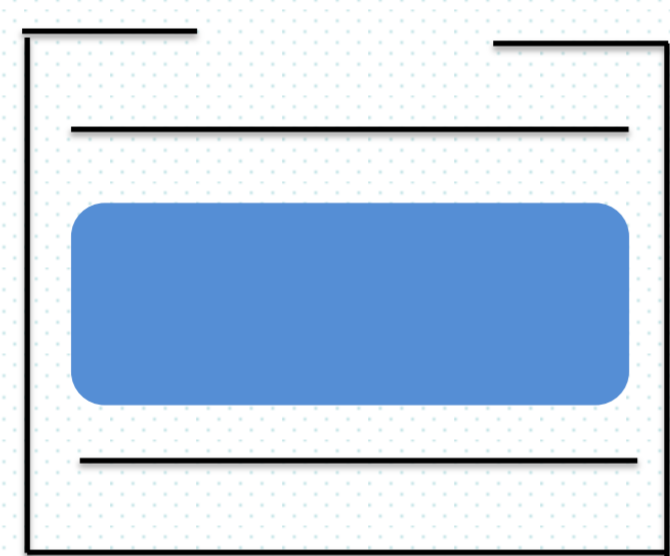


Yes! Si and Mo react to form silicides...

....what if we wrap Si into a Mo envelope to avoid its flowing away from the joined area ?!

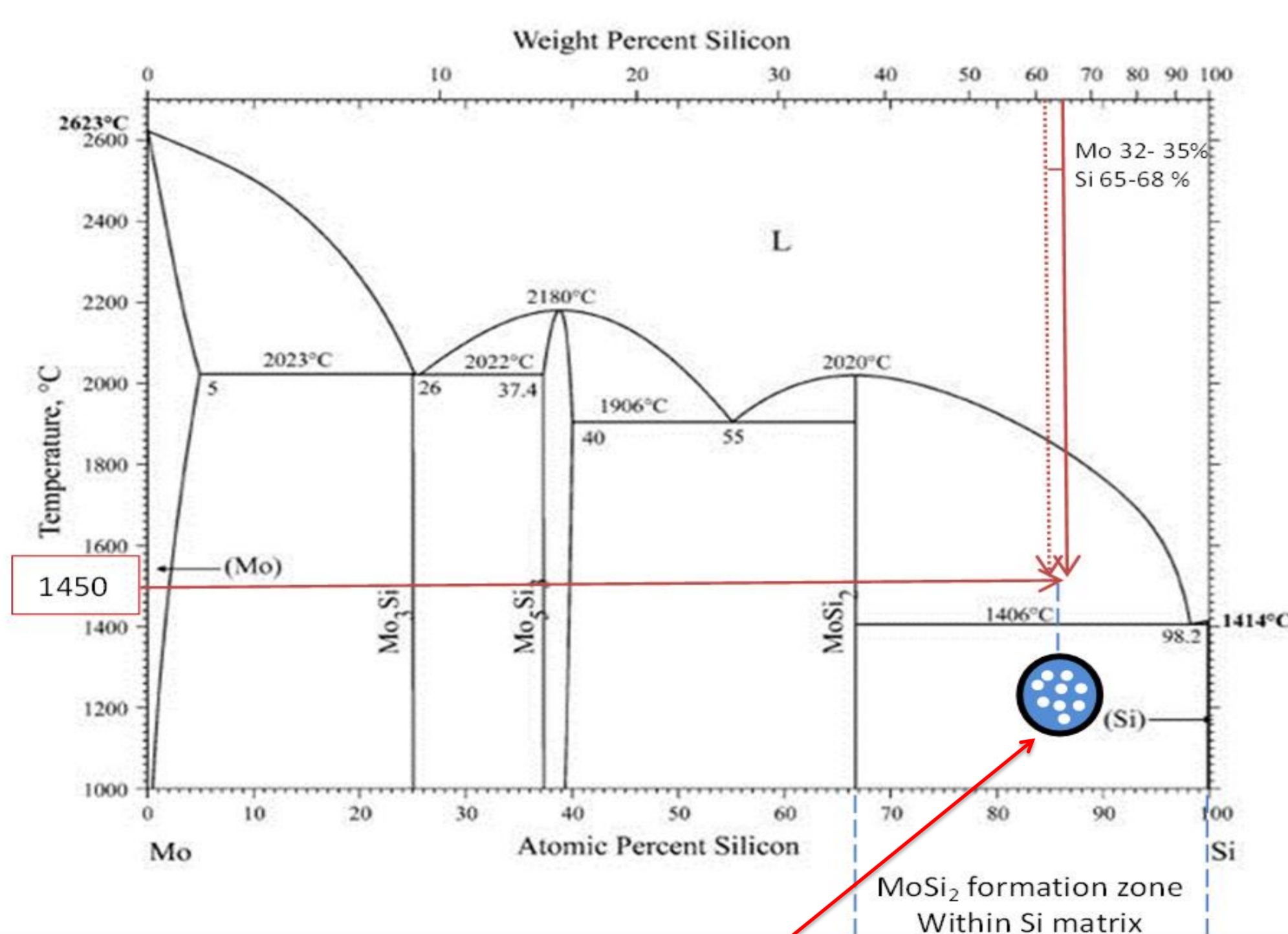
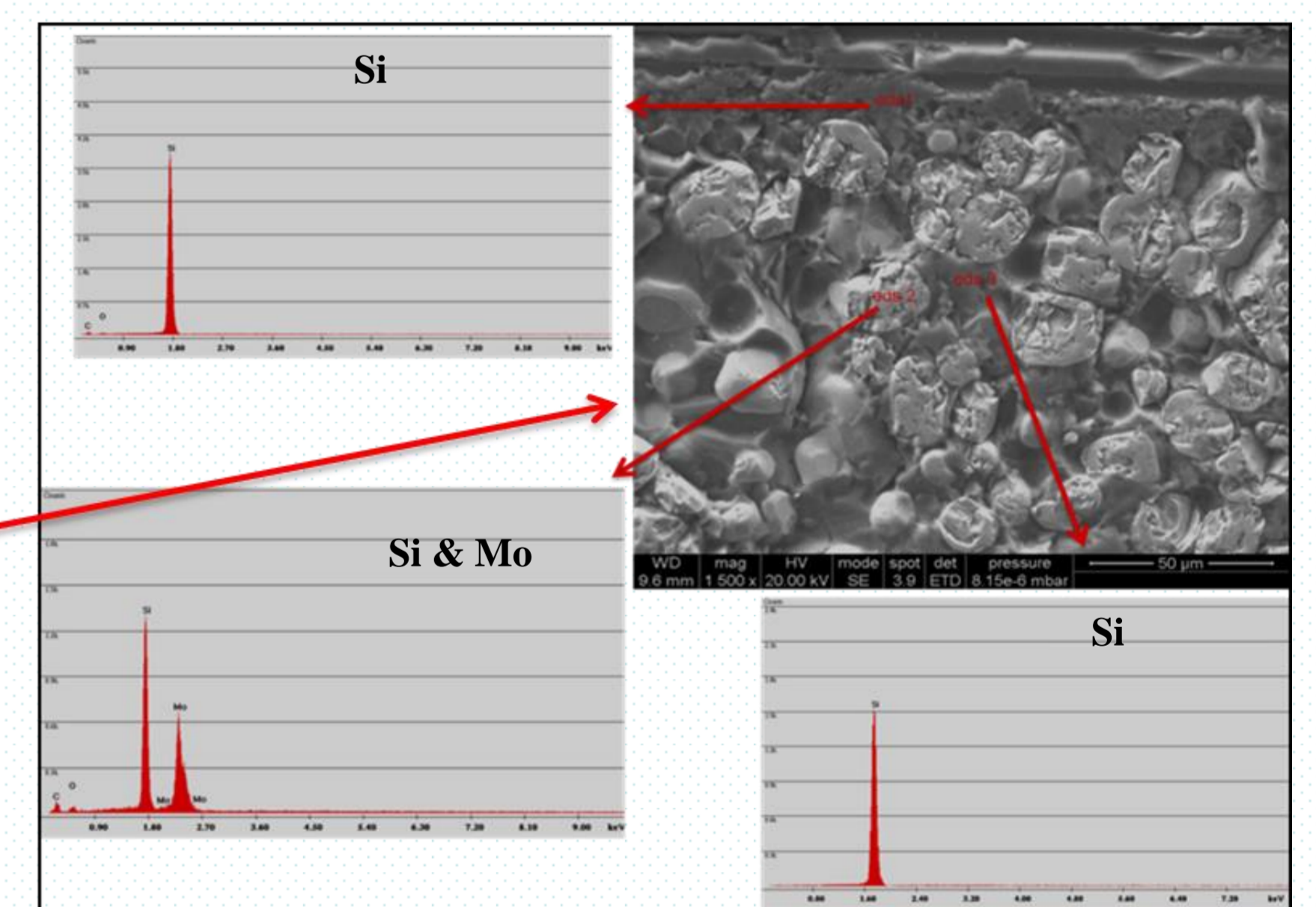


## Si wrapped in a Mo envelope



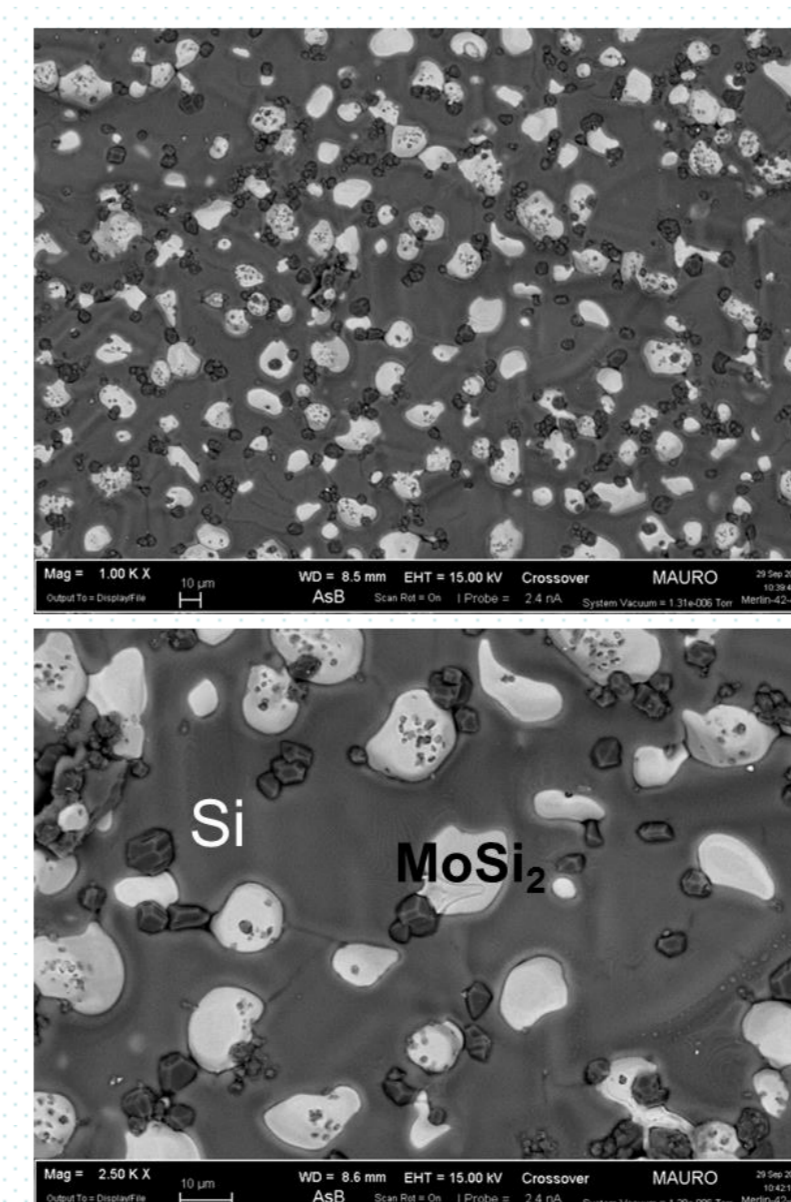
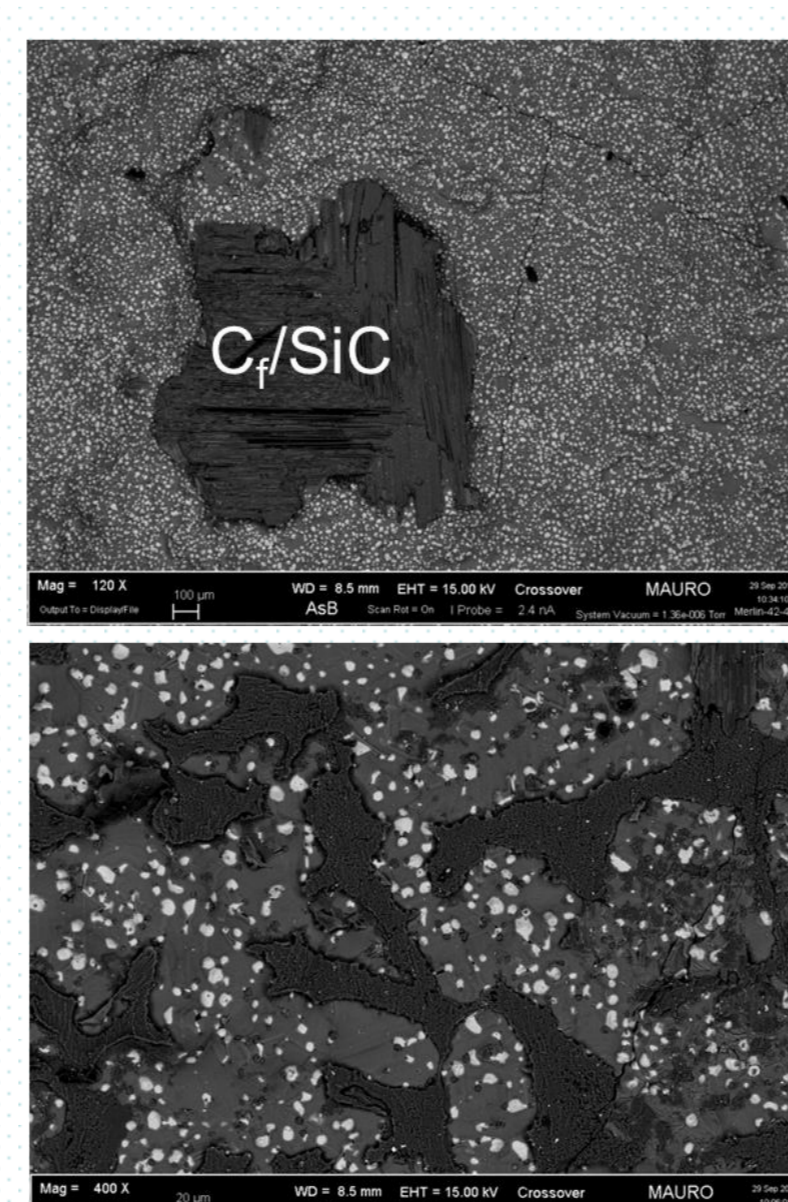
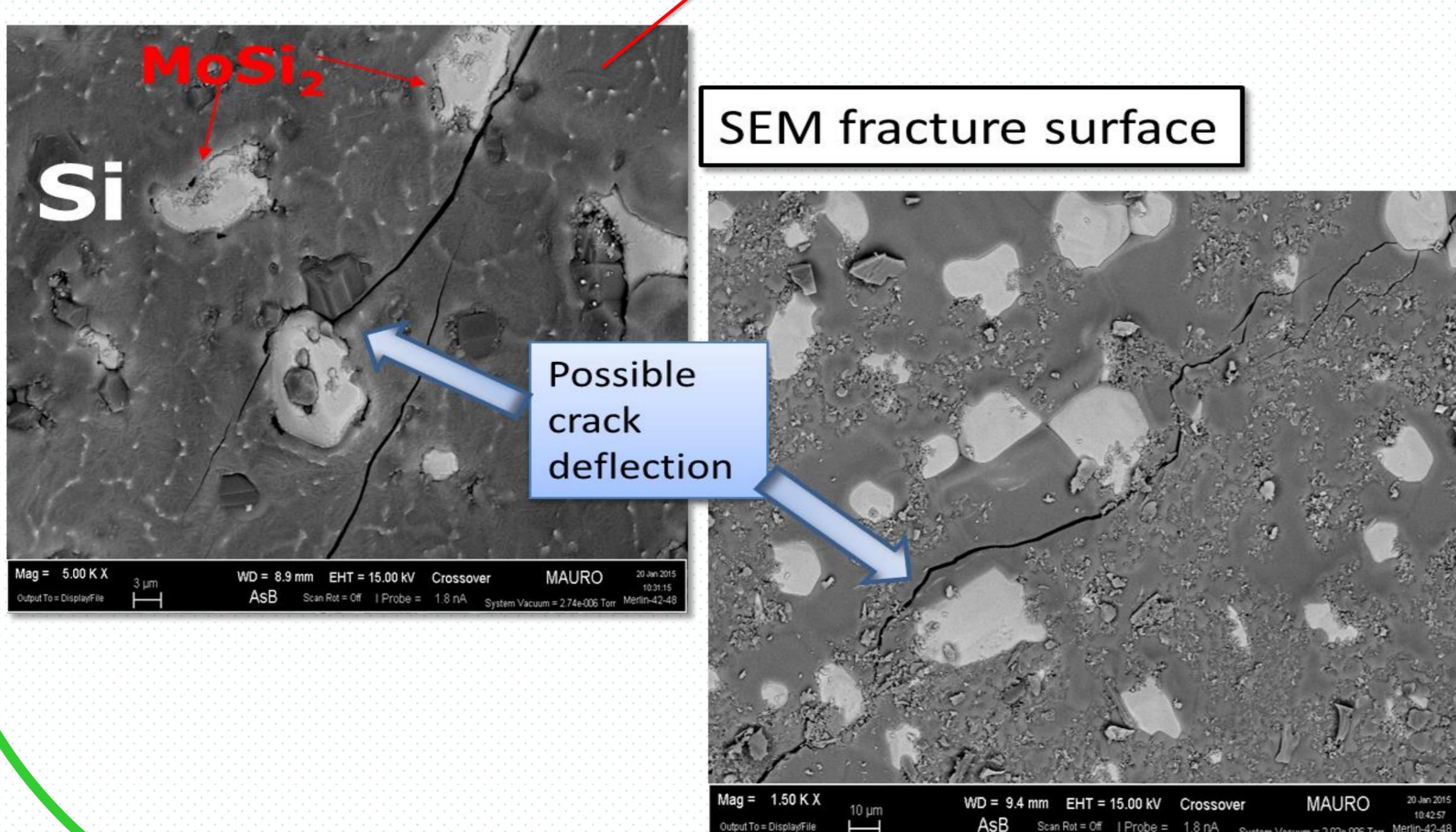
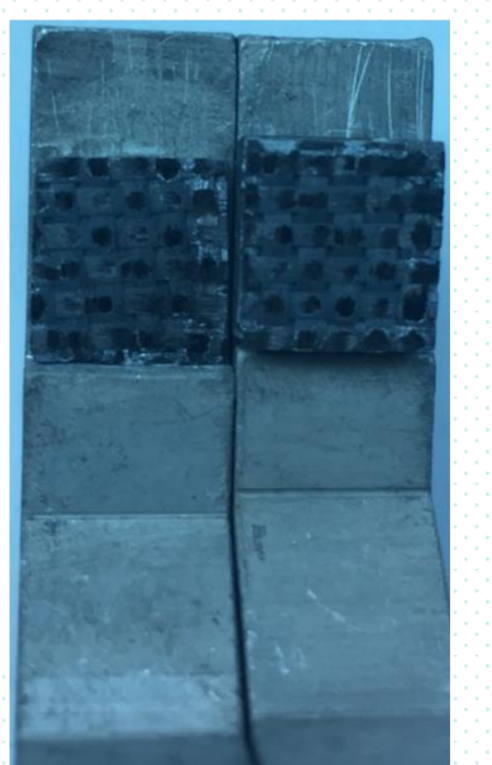
Element	Wt%	At%
Si	38.66	68.28
Mo	61.34	31.72
Total	100	100

The EDS wt % confirms the formation of  $MoSi_2$ , which has a high melting temperature (2030 °C),  $MoSi_2$  is very stable and oxidation resistant at high temperature



## Si-MoSi2 joined C/SiC

All mechanical tests gave interlaminar failure of C/SiC



### SUMMARY

- *in situ* formation of  $MoSi_2$  particle reinforced Si matrix composite as pressure-less joining material
- silicon infiltration avoided in C/SiC
- *in situ*  $MoSi_2$ : high melting point (2020°C), oxidation resistance, Si creep behaviour at  $T > 1000^\circ C$  possibly improved, increase of fracture energy respect to pure Si joints, ...
- To be tested with other materials