Top Seal Status

Andrey Elagin
for the Chicago PSEC Team

One Slide Report

- Glass on glass always seals (if everything is done right)
  - requires good quality metallization on the seal surface
  - need to pay attention to stack-up, compression, etc
- When switched to ceramic we were encouraged by vendors and experts in the field that our glass recipe should work on fused silica on ceramic
  - 1" trials worked
  - CTE mismatch between fused silica and ceramic dominated over effects we are dealing with right at the moment
- Currently all ceramic trials have leaks (small or really large)
  - surface roughness is a factor
  - something in our recipe does work since we are getting of up to 16"-long leak-tight sealing lines
- Most effort goes into the top seal (yes, we've been there...)

Cs-In-(X?) Flakes/Powder Story

We think it's solved now

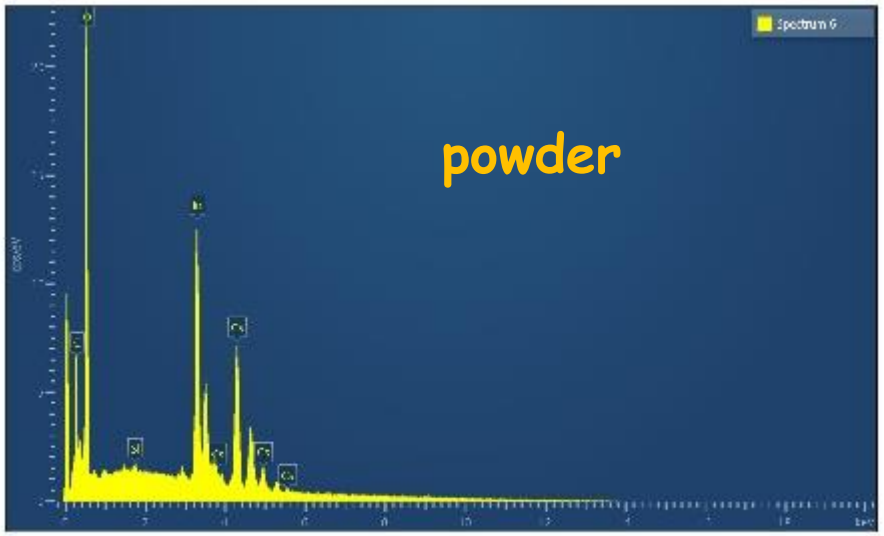


Figure 4: A spectrum from a **dust** fleck shown in the SEM picture above. The peaks indicate the existence of indium and Cs, and not their quantitative relative composition.

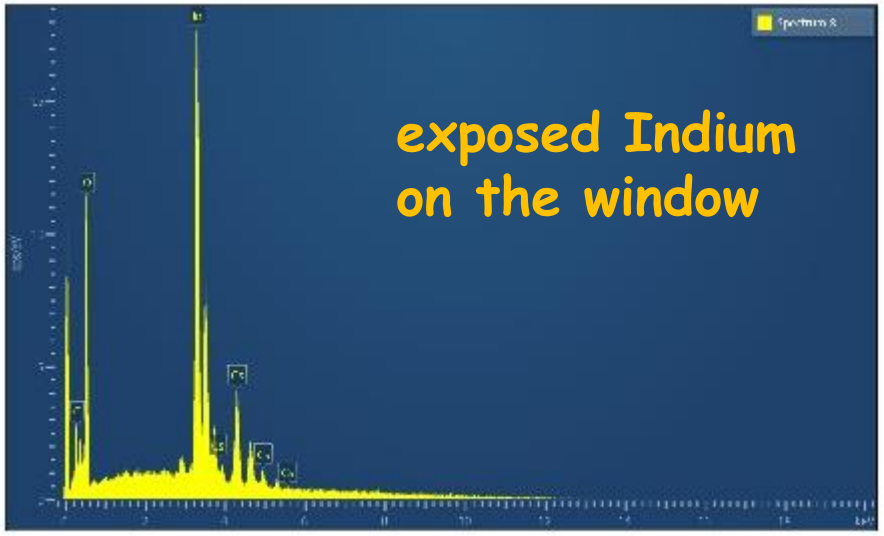
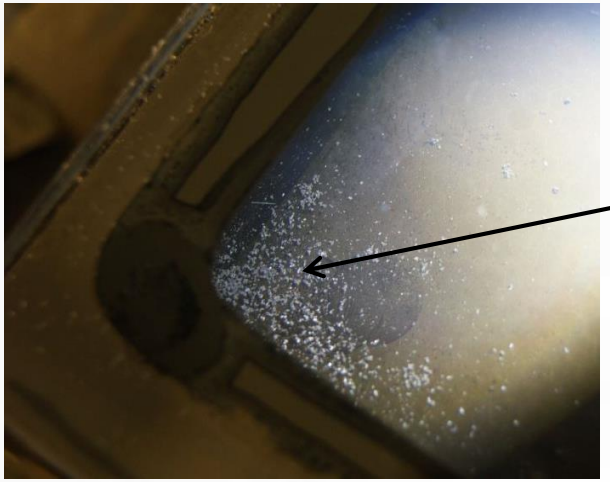


Figure 5: This spectrum is taken from the layer on the **window** that had turned black and flaky. The spectrum looks almost identical to that of the dust flecks.



Sealing surface
on top of sidewall

Powder after
exposure to air

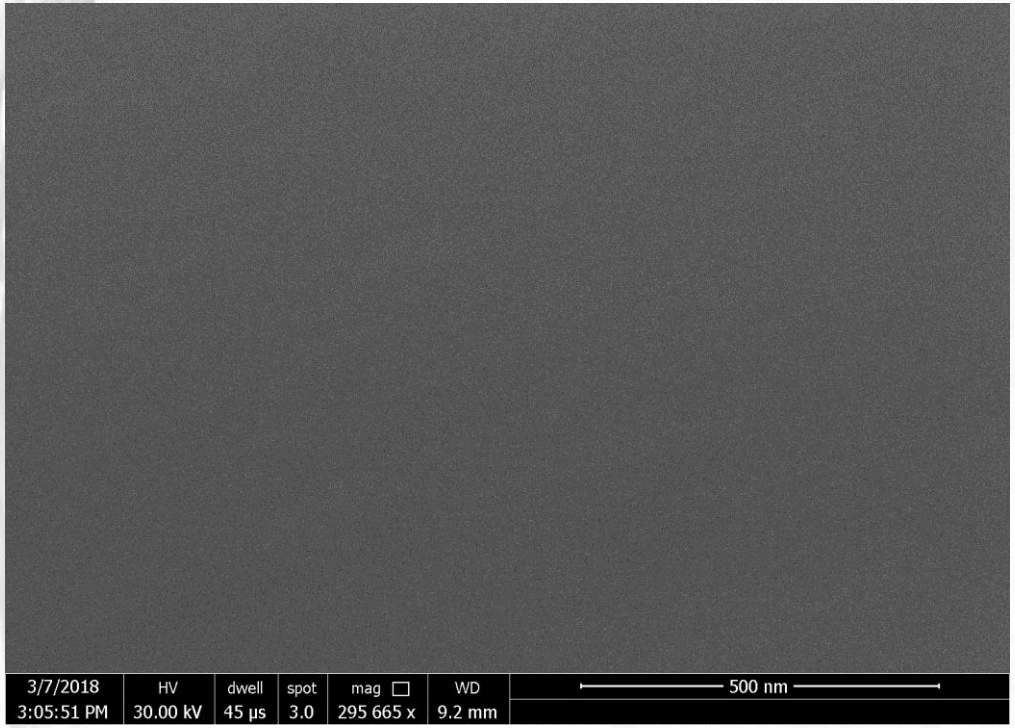
We got new windows with improved metallization to avoid/limit In "seen" by Cs

Indium Seal Line

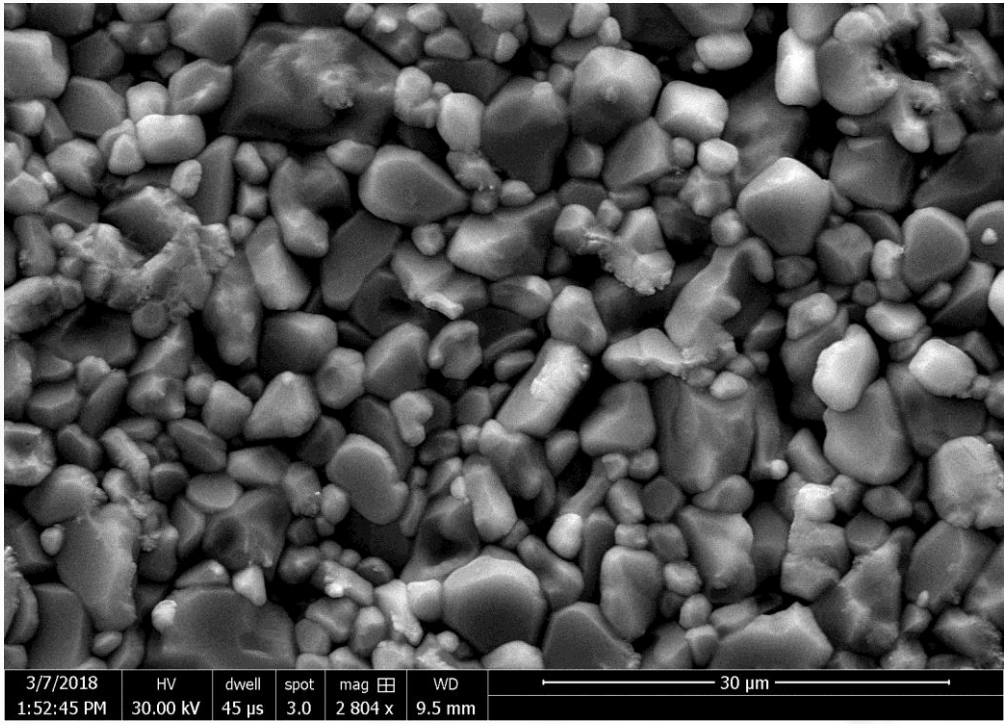
Ceramic Surface Roughness

SEM, FEI Quanta 650 FEG
Expert help by Anna Mukhortova at PNF

Typical glass



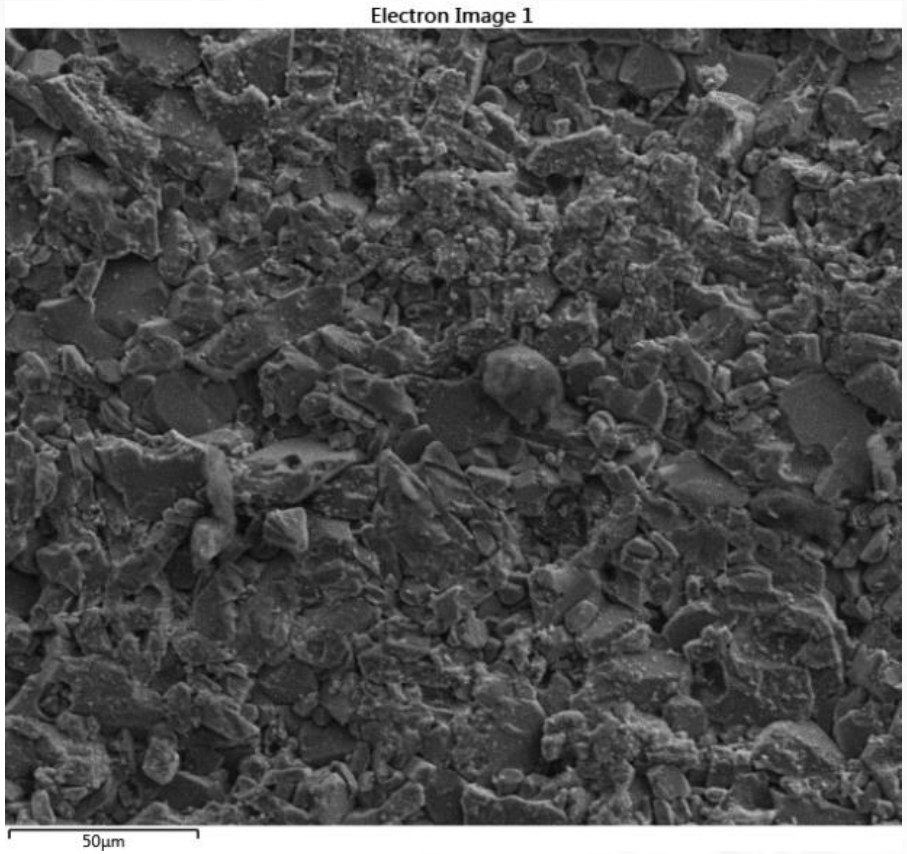
Ceramic from vendor A



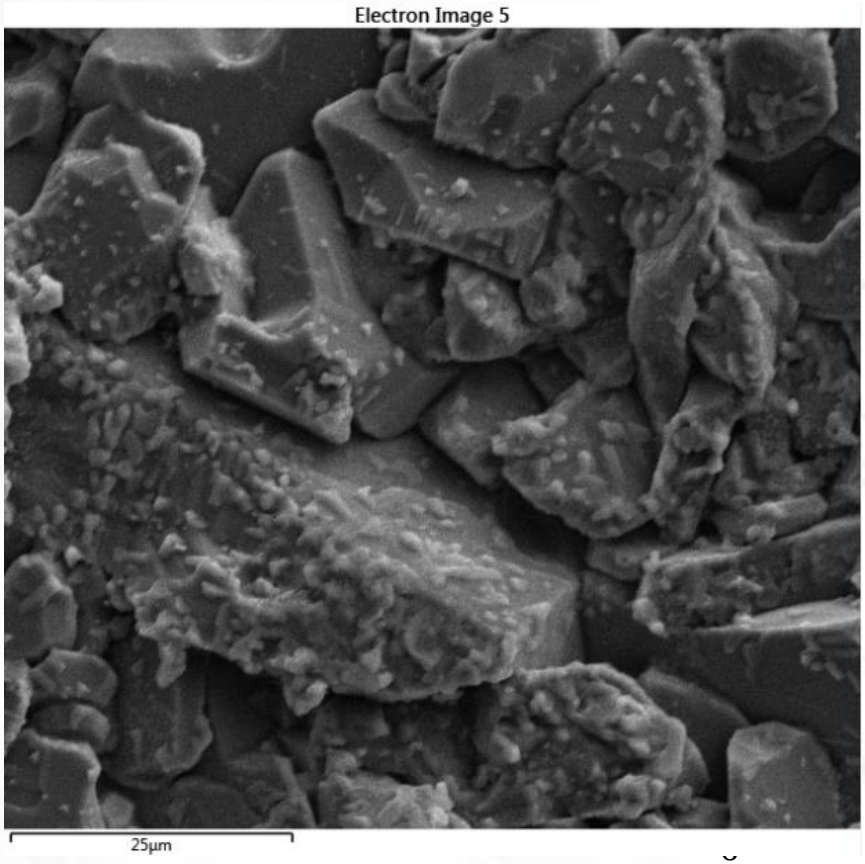
Ceramic Surface Roughness

FIB-SEM, TESCAN LYRA3
Expert help by Levke Koop at Geophysics

Ceramic from vendor B



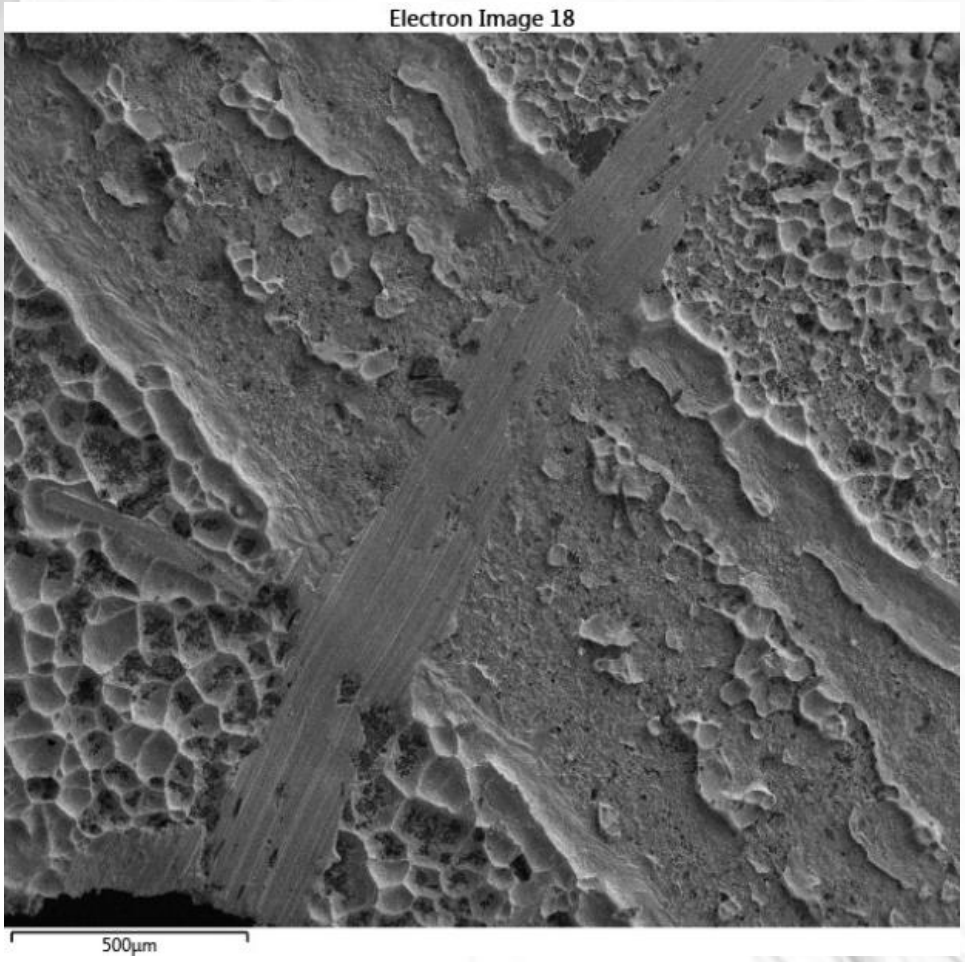
Ceramic from vendor B



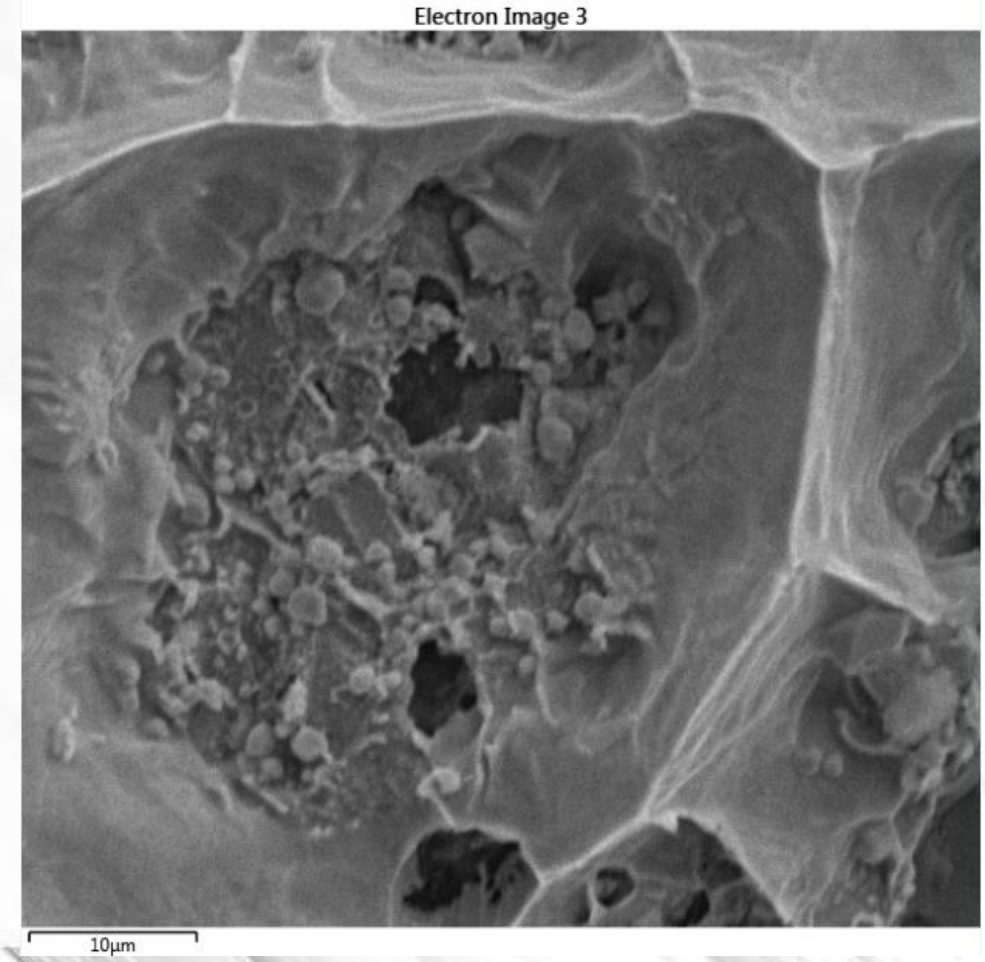
Ceramic Surface Roughness

FIB-SEM, TESCAN LYRA3
Expert help by Levke Koop at Geophysics

Ceramic from vendor C
(post seal analysis)



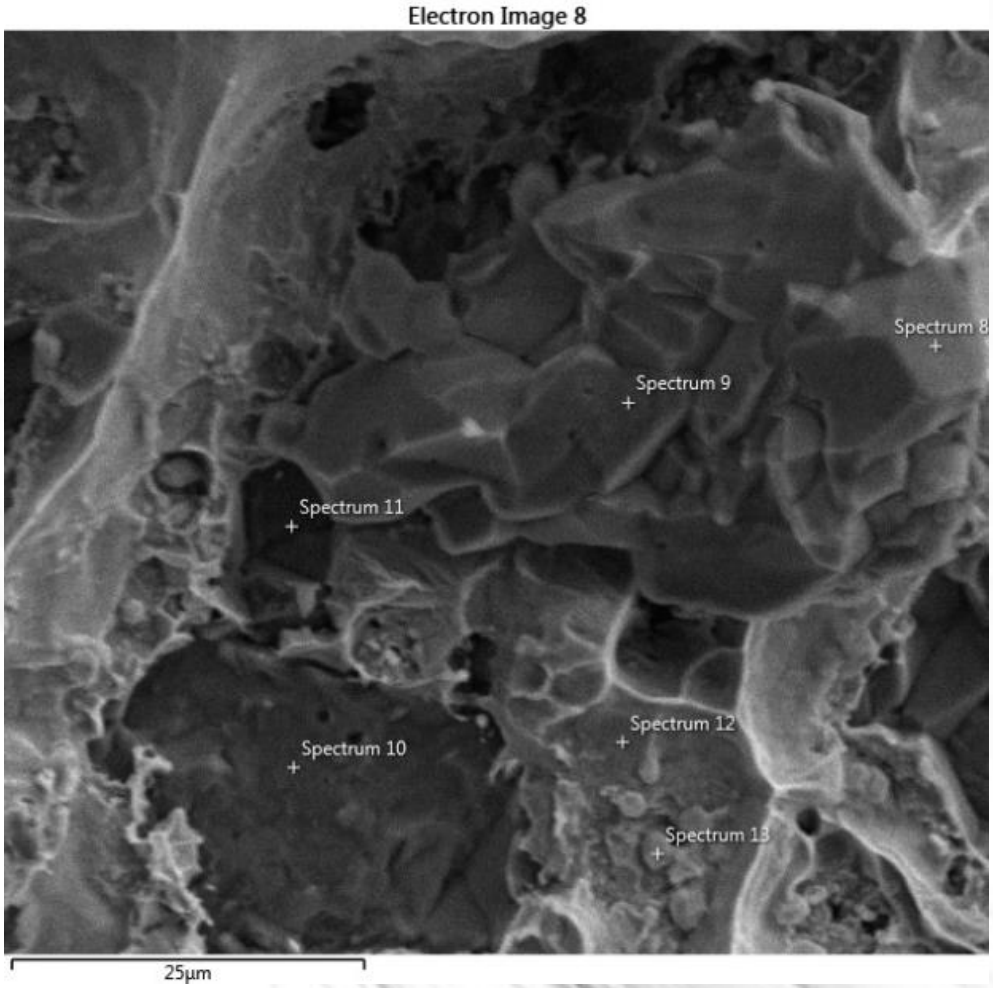
Ceramic from vendor C
(post seal analysis)



Ceramic Surface Roughness

FIB-SEM, TESCAN LYRA3
Expert help by Levke Koop at Geophysics

Ceramic from vendor C



Ceramic Surface Roughness

Optical Microscope Olympus LEXT OLS 5000
Expert help by Justin Jureller at JFI/MRSEC

Precision in XY up to ~ 100 nm
Precision in Z up to ~ 5 nm

250x250μ