Generation and decomposition of volatile tin hydrides monitored by *in situ* quartz crystal microbalances*

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Introduction

- To generate the EUV light, Sn plasma can be used
- Sn can accumulate as debris on collector optics
- Upon contact with H radicals, volatile metal hydrides form

  $Sn + H \rightarrow SnH_4$
- These hydrides may decompose elsewhere in the system

  SnH_4 + surface → Sn deposit on the surface + $2H_2$ (g)
- This causes reflectivity loss, if SnH_4 decomposes on optics

Experimental

- 2 QCM sensors:

  Sn coated "source" → to act as the contamination source

  Au coated "target" → to act as the decomposition surface
- Accurate control of the crystal temperatures (within 0.01 K)
- H radicals generated by thermal cracking on a hot filament
- Characterization by *ex situ* XPS, XRF and SEM imaging

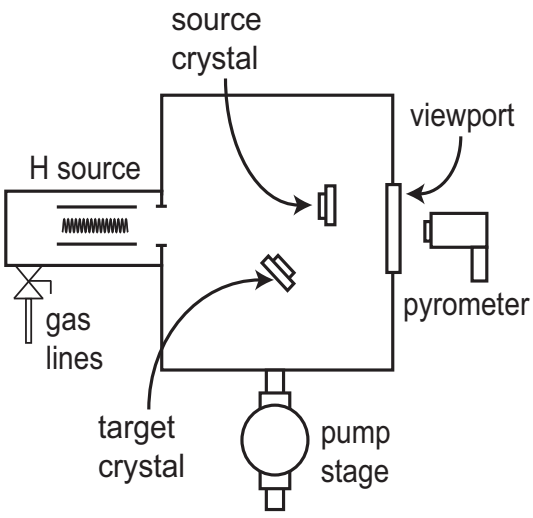

Fig. 1. Illustration of the experimental setup

Results

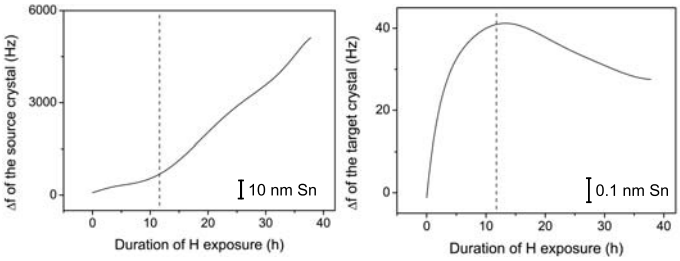

Fig. 2. Change in oscillation frequencies with H and SnH_4 exposure

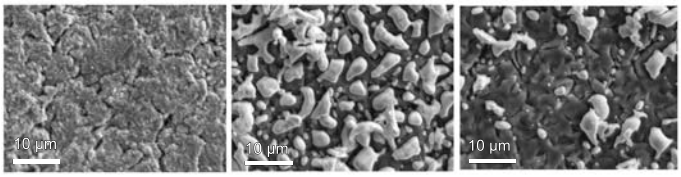

Fig. 3. Change in the Sn surface morphology with H exposure

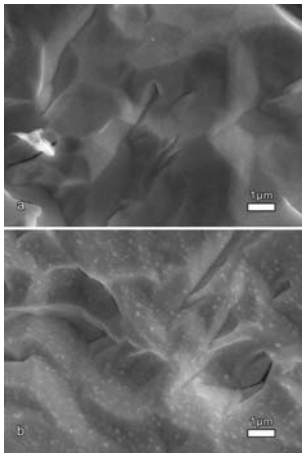

Fig. 4. Island like features on the Au surface due to SnH_4 exposure

Conclusions

- Only one SnH_4 per 90000 incident H radicals
- High (~100 %) SnH_4 decomposition efficiency
- Major reorganization on the source crystal surface
- Island like features on the target crystal due to Sn

S.P.A.M.

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