IFIC status and plans

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Budget 2023

- My own project (2021-2024)
  - Should cover the glue R&D part (purchases of glue for tests, tool manufacturing and/or acquisition, dummy sensors for tests…)
  - Sr90 radiactive source recently acquired
- In October: recently approved budget for 2023-2024 (with possible extenstion in 2025, to be clarified)
  - 1 postdoc (start in March)
  - 1 student (start in March?)
  - Equipment → lab equipment such dry cabinet, gluing robot and accessories, etc.

  Companies already contacted, waiting for the first round of glue R&D for decission.
  - ~20-25K for expendables (including sensors)
  - Money still not in our pockets !!

- More news: the IFIC has a cold plasma device for cleaning sensors before gluing → get ride out of oxydation layers !
  - Example https://www.youtube.com/watch?v=DN5rCKOS52k

Conductive glue options

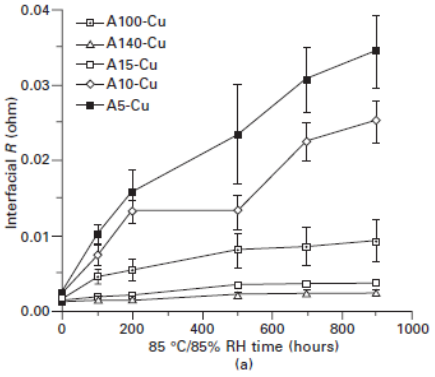
- IFIC is having discussions within CALICE and FCAL experts
- After my visit to Tel Aviv (Nov 2022), few alternatives under consideration:
  - “Standard” Epoxy-silver (or even Epoxy-gold!)
  - Anysothropic Film Bonding.
  - Micropearls (still an unknwown for me) → Sekisui company https://www.sekisui.de/products%20and%20technologies/fine-chemicals/micropearls
- Is the silver part of the glue creating a problem due to neutron radiation??
  - Still unclear. Discussions with Sasha and others on this.
  - Nuclear scientists from IFIC have some experience with neutron lines: nTOF at CERN and HISPANOS in Sevilla. First discussions started, **shall we schedule a meeting with more experts in January?**

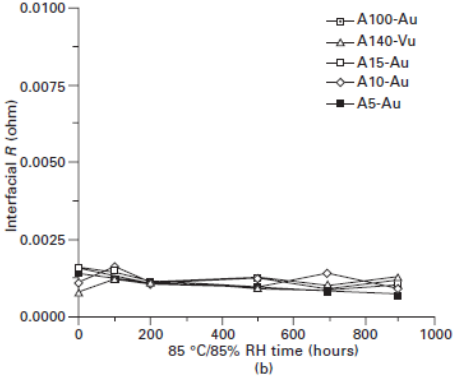
Epoxy based options

- EJ2189 (silver based)
  - Standard of CALICE.
  - Allows low temperature curing (40 or even 23 degrees)
  - Life pot of only few hours.
- H20E (silver based)
  - The standard comercial choice. Passes the NASA outgassing standards.
  - Curing at (at least) 80degrees for 3h.
  - Life pot of 3 days !!
- H44 (GOLD Based)
  - More expensive. Waiting for a note on this **→ update: the 0.5oz price is 6kE !!!. (to be compared with 400euros for 1oz of the others)**
  - 1 component only: 6 month pot life. (longer lead times)
  - Passes the NASA outgassing standards.
  - Requires 150degrees curing
  - Gold may offer less oxydation (gold vs aluminium) and less activation due to neutrons.

Tests to be done January-April 2023

- We have purchased a set of dummy substrates with aluminum and gold bath (as the Hammatsu sensors)
  - Delivery in ~ January
- We have orderd the epoxys (still waiting for the note on the gold based).
  - Delivery in January-February
- Yan is designing a special kapton fanout to be glued to the dummy sensors and perform resitance measurements of the glue dots.
  - Using a precision ohmemetre to measure mOhms.
  - Production/delivery?March?
- We are getting trained in the use of a climatic chamber here at IFIC: the idea is to tests the different glues and surfaces after several humidity cycles and check the resistivity.
- Also access to a x-ray machine for a “visual” inspection.





4.9 Ag ICA contact resistance changes at 85/85: (a) on Cu contacts, (b) on Au contacts, with (c) corresponding bulk resistivity variations.

Bibliography reference on epoxy+silver glues performance (attached to the agenda)

ACF bonding

- Based on thin film which is conductive only in Z-axis (anysothopic conductivity)
- Requires a thermal bonding (up to 150degrees, but very localised and only for few seconds).
  - Issue for CALICE PCBs… what about the FCAL fanouts?
- Example:
  - https://www.youtube.com/watch?v=biHFJFHpqdM
- In our case, every wafer will have 16 bonding stripes of ~4mm, each one for a row.

- Contacted 2 companies:
  - AMADA weld offers a test trial in Holland.
  - If satisfied, we could have two options: 1) they do the bonding for us or 2) we purchase a bonding machine suitable for us. This latter option seems complicated although I have no ballpark for the price (but a “simple” gluing robot costs ~20KE)
  - **More discussions with experts needed.**