



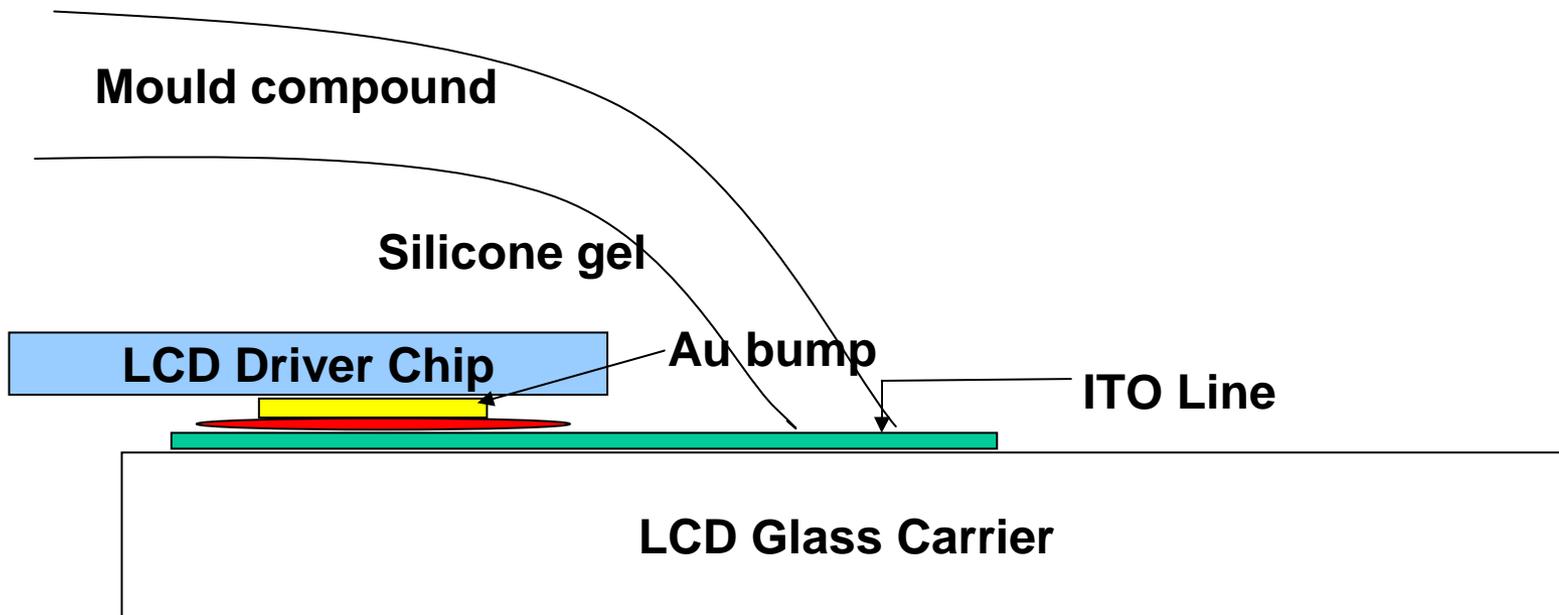
Materials Science & Technology

Open Degradation on ITO Lines for an LCD Driver

Peter Jacob, Empa Dübendorf Dept. 173

Setup

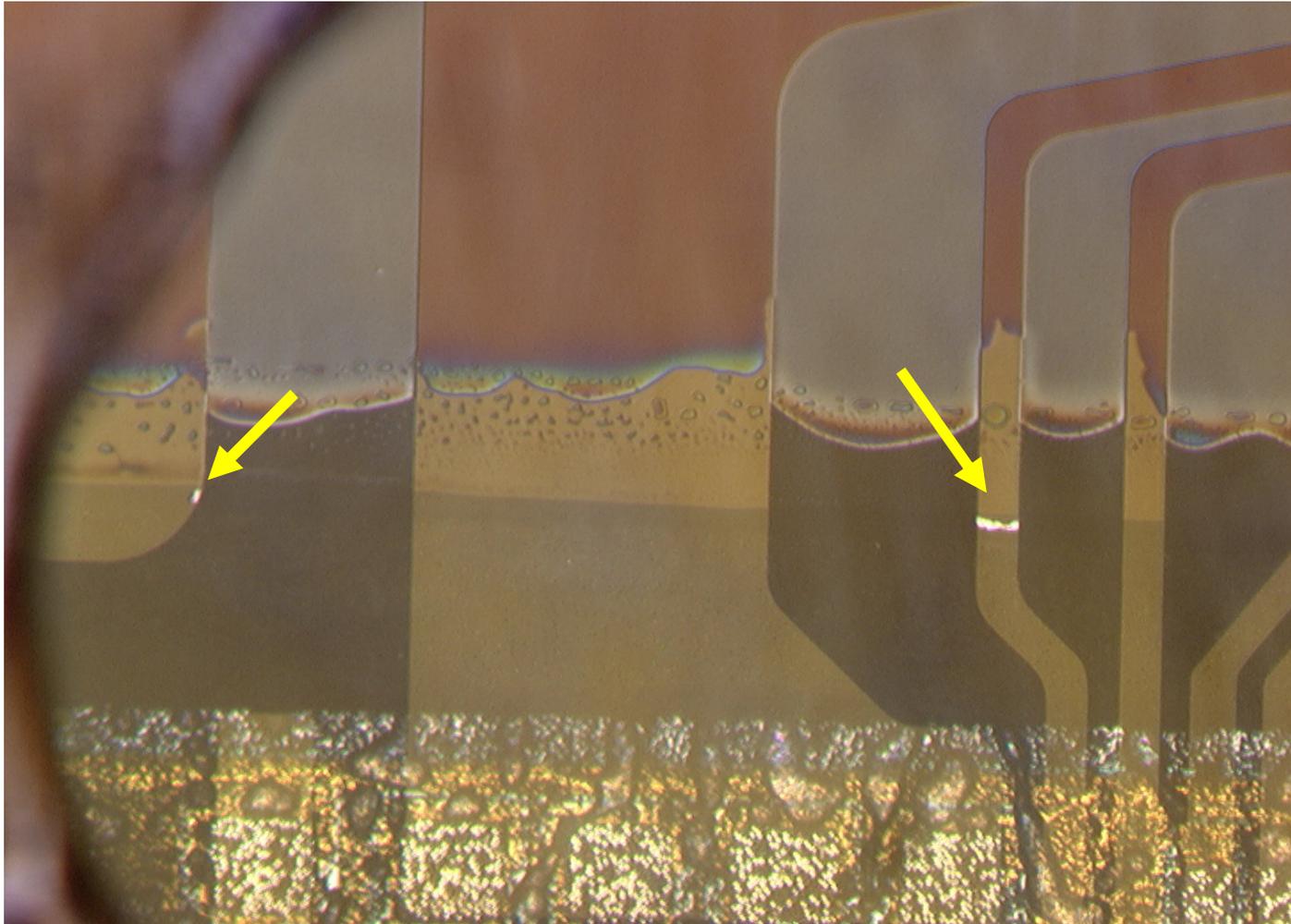
- LCD-driver IC directly glued onto connecting ITO lines on LCD glass
- Glue includes silver particles
- 2-step protector: soft silicone gel and hard top mould compound



Failure Description

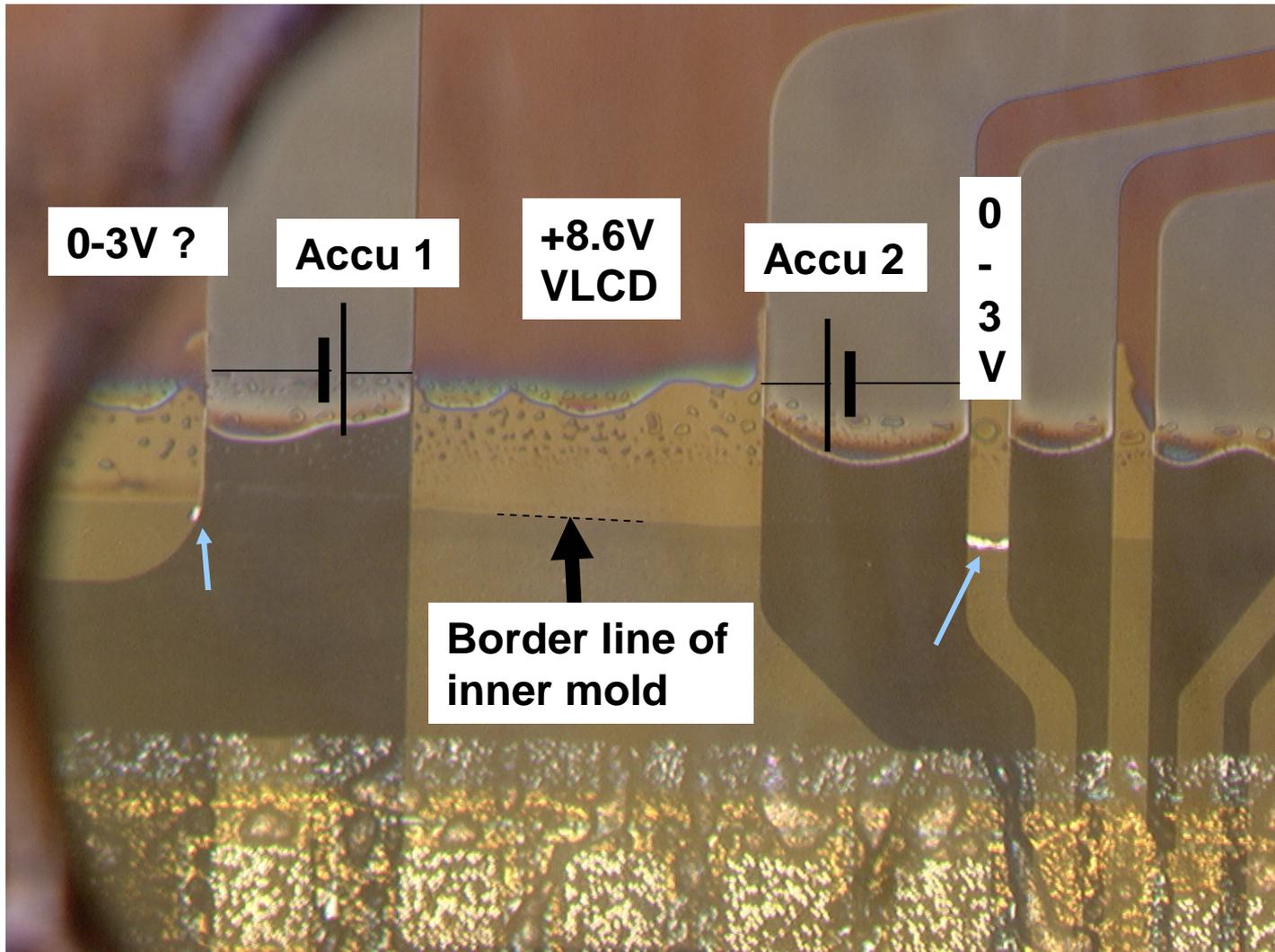
- After some time of operation, repeatedly LCD segments failed to display correctly
- Electrical analysis has shown that always the same ITO line to the LCD driver was open
- No specific or unusual setup, current density or other observations were made considering this line

Optical setup, image taken through the glass



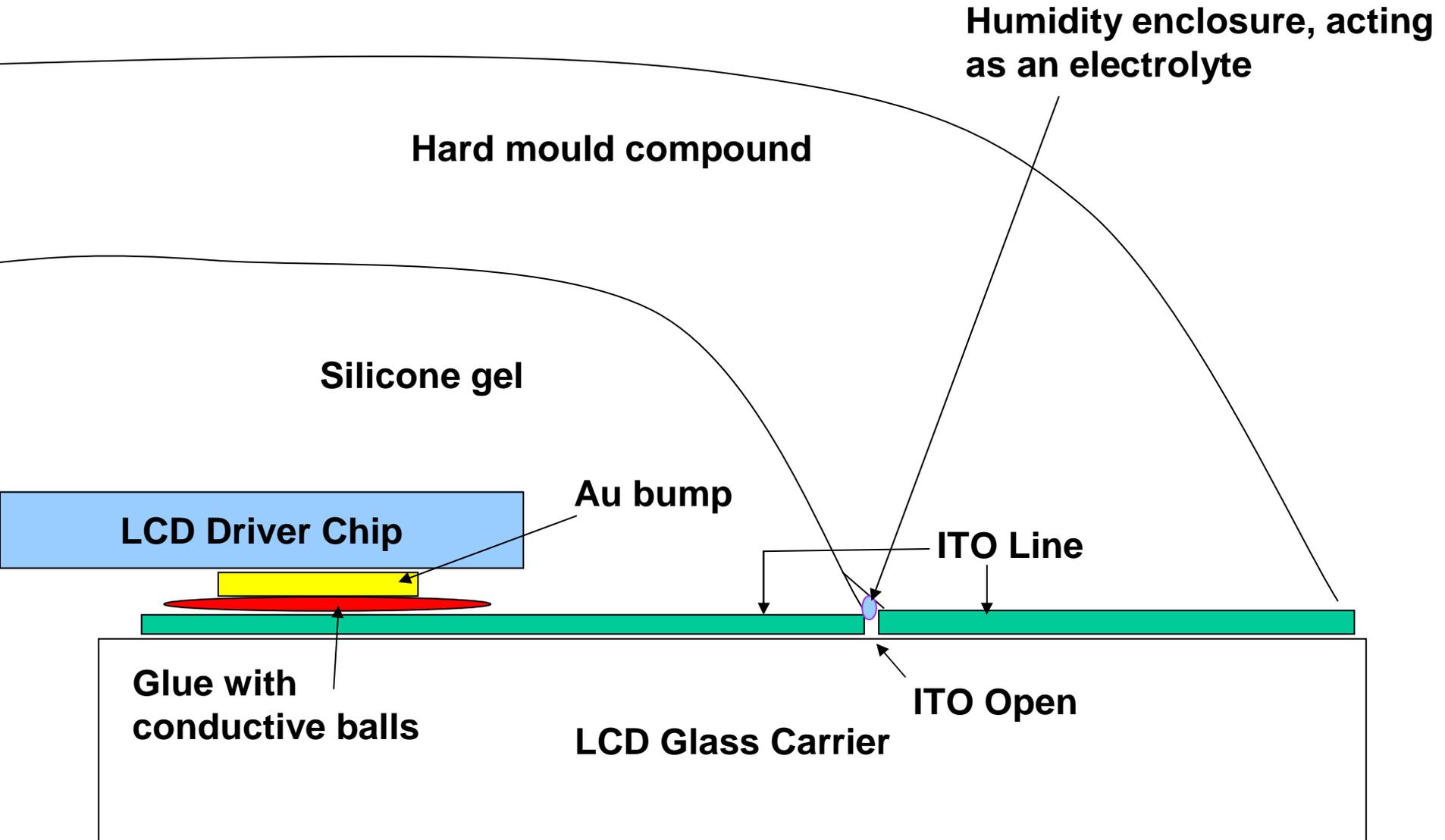
Optical microscope inspection has always shown the same attack points: one small line right from the big one was completely open, the wider line right from the thick one never was attacked

Voltage Potentials and electrochemical evaluation of the situation



VLCD is the line with the maximum potential on-site. Compared to neighbour potentials, electrolytic cells have been generated, consuming material of the „minus“ side.

Cross sectional drawing



Conclusions

- Humidity and electrical field strength can generate electrolytical reactions on LCD-ITO lines – finally causing opens
- Device and ITO/ LCD layout should consider to arrange pins in a manner which avoids abrupt potential changes of neighboured lines. Vdd and Vss lines are best arranged at corners, where enough space is available to reduce field strength
- After a suitable redesign enhancing critical spaces, no further reliability problems occurred