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55µm-pitch indium bump deposition on MEDIPIX single die without using photolithography

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Hybrid MEDIPIX detectors are widely used for a variety of applications including scientific experiments at synchrotrons, X-ray Free-Electron-Lasers (XFEL), or with other radiation sources [1]. For many years, MEDIPIX Application-Specific Integrated Circuits (ASIC) and sensors are usually processed on large wafers using a photolithographic lift-off process in order to deposit interconnects such as indium bumps onto the pixel arrays of ASICs and sensors. After deposition, a wafer is singulated into the individual dies and subsequently sensor chips are connected with read-out MEDIPIX ASICs in a flip-chip process.
Sensor and ASIC wafers are very expensive and once a process for the hybridization is chosen, a large number of chips are generated having all the same process parameters. For testing process parameters (e.g. flip-chip bonding) or developing detector prototypes, it is desirable to process smaller batches of single dies with a variety of different process parameters. However, applying photolithography to single die with spin-coated photoresist (PR) across the entire die is not a simple task. Due to the large edge bead of the PR, pixels at the periphery of the die will not be processed perfectly.
Here we demonstrate a uniform indium bump deposition onto a 256x256 pixel array (55µm-pitch) of a MEDIPIX individual die using a mechanical masking method that does not require photolithography. Such method will allow testing and optimizing indium bumps on a variety of MEDIPIX chips without processing a large number of expensive wafers. This masking method for single die is compared to the wafer-scale process of indium bump deposition on MEDIPIX ASICs using photolithography.
The images show the aligned deposition of indium bumps to the 55µm-pitch array on a MEDIPIX die (optical microscopy image and side view of MEDIPIX chip using SEM).
Ref.: [1] https://medipix.web.cern.ch/

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