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Development of thin pixel detectors on epitaxial silicon for HEP experiments

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The foreseen luminosity of the new experiments in High Energy Physics will require that the next generation of vertex detectors will be able to sustain fluencies up to $1 \times 10^{16} \text{ cm}^{-2}$. Moreover, in many experiments there is a demand for the minimization of the material budget of the detectors. Therefore, thin pixel devices on epitaxial material are a natural choice to fulfill these requirements due to their rad-hard performances and low active volume. We present an R&D activity aimed at developing a new thin hybrid pixel device in the framework of PANDA experiments. The detector is a p-on-n pixel sensor realized starting from epitaxial silicon wafers, in which the sensitive area is the epi-layer itself, while the low-resistivity substrate acts as a mechanical support. After completion of the fabrication, the substrate is back thinned down to a value slightly larger than the epitaxial layer thickness, which can be in the order of 50-100 microns. We present the main technological steps and some electrical characterization of the fabricated devices before and after back thinning and after bump bonding to the FE electronics.

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