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Preparation and characterization of micro-nano engineered targets for high-power laser experiments

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The continuous development of ultra-fast high-power lasers (HPL) technology with the ability of working at unprecedented repetition rates, between 1 and 10 Hz, is raising the target needs for experiments in the different areas of interest to the HPL community. Many target designs can be conceived according to specific scientific issues, however to guarantee manufacturing abilities that enable large number production and still allow for versatility in the design is the main barrier in the exploitation of these high repetition rate facilities. Here, we have applied MEMS based manufacturing processes for this purpose. In particular, we have focused on the fabrication and characterization of submicrometric conductive membranes embedded in a silicon frame. These kinds of solid targets are used for laser-driven particle acceleration through the so-called Target Normal Sheath Acceleration mechanism (TNSA). They were obtained by top-down fabrication alternating pattern transfer, atomic layer deposition, and selective material etching. The adaptability of the approach is then analyzed and discussed by evaluating different properties of targets