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An Alternative Approach for Fabricating Ring-shaped Spin-transfer Torque RAM Devices ROBERT BURKE, ALAN EDELSTEIN, Army Research Laboratory — Several techniques have been investigated to fabricate spin-torque transfer RAM (STT RAM) devices with ring-shaped geometries. In-plane STT RAM devices with ring-shaped geometries are advantageous in that the magnetization is confined to the ring structure, eliminating the demagnetization field. This, in turn, reduces the critical current needed to switch the magnetization. To date, the most popular fabrication technique of ring-shaped STT RAM involves a combination of electron beam lithography and ion beam milling. A significant issue with ion beam milling, however, involves the redeposition of the MTJ material on the ring-shaped surface, which leads to shorting of the devices. In our study, we seek an alternative method for forming the ring-shaped devices which eliminates the shorting problem. As a result, we are using a nanopillar and cap structure template to define the ring-shaped geometry of the devices. The nanopillar and cap structure template is fabricated using a combination of a bilayer resist and electron beam lithography to either create a mold for the deposition of a nanopillar and cap structure via ion beam deposition or a resist-based nanopillar and cap structure. This study will report on the results of this process and its prospects as an alternative to ion beam milling.

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