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Magnetic anvil cells driven by pulsed-power generators[1] P.-A. GOURDAIN, M. B. ADAMS, M. EVANS, University of Rochester, R. D. MCBRIDE, University of Michigan, A. B. SEFKOW, University of Rochester, C. E. SEYLER, Cornell University, G. COLLINS, University of Rochester — Magnetic anvil cells (MAC) use a gas, foam or solid damper to compress a material sample via magnetic pinch forces. Unlike diamond anvil cells (DAC), which are limited by the material strength of diamond, MAC have no mechanical limits. Only the amount of current that can be delivered to the MAC limits the final pressure at which a material sample can be compressed. Another main advantage of MAC over DAC is the ability to heat the sample, allowing to produce warm dense matter. The damper that surrounds the material sample has several functions. Initially, it diverts the current away from the sample, preventing electrothermal instabilities inside the sample. When the damper has fully imploded, the current commutes from the damper to the sample in less than 10 ns. Since the current is already on its way to reach a maximum, hundreds of kilobars are suddenly applied to the sample, limiting plasma ablation and surface inhomogeneity, which can later seed magnetic Rayleigh-Taylor instabilities. This work shows that the phase and chemical composition of the damper is critical to the homogeneity of the compressed sample and will change depending on the current level required to reach the final pressure.

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