In this paper, the design, fabrication, pre-polish coating, and polishing of a reaction bonded (RB) internally cooled silicon carbide (SiC) mirror is described. The mirror is developed from a mold of SiC powder in a near net shape, and then infused with silicon vapor to make a dense mirror substrate. The mirror surface is then polished rough, coated with a layer of SiC, and then polished to a final finish. The design and manufacturing of this mirror—intended to be used as a multilayer substrate on high-heat-load undulator beamlines—is described, and data on the surface figure and finish is provided. This type of a mirror can provide an attractive alternative to internally cooled silicon mirrors. Because the substrate is made in one piece, it avoids the frit or metal bonding that is necessary for silicon substrates. Advantages of RB SiC mirrors include lower cost and higher reliability.

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