Catalytic materials-assisted growth of MB₆ (M=Sr, Ba) 1D nanostructures was realized. The MB₆ 1D nanostructures are appealing candidates for high temperature thermoelectric energy conversion. The growth mechanism of as-synthesized MB₆ nanostructures can be attributed to an non-traditional vapor-liquid-solid mechanism. Mechanical properties of individual nanostructures were studied by nanoindentation. Results show that the MB₆ nanostructures are several tens of nanometer in diameter and up to ten micrometer in length (Fig. a). Nanoindentation (Figs. b and c) revealed that the Young’s modulus of BaB₆ 1D nanostructures is around 200 GPa based on standard Oliver-Pharr method.