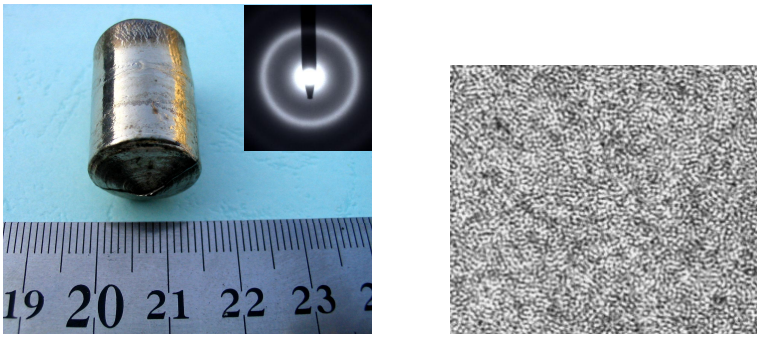
大块非晶合金形成机制及力学行为

Glass formation mechanism and mechanical behaviors of bulk metallic glasses

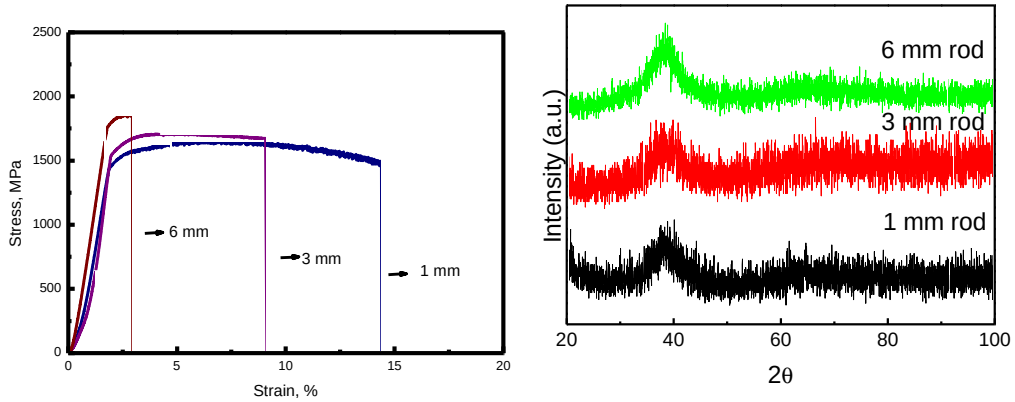
发现了大块非晶合金压缩断裂过程形成纳米弹性波，压缩强度和塑性具有强烈的尺寸效应；提出了一种设计大块非晶合金成分的新方法和表征非晶合金玻璃形成能力的判据；获得了国际上玻璃形成能力最强的 Fe基非晶合金成分。

We have observed elastic-wave patterns on nanoscale that form in the compressive fracture process of a bulk metallic glass (BMG) and found the dramatic effect of sample size on the plastic deformation capability of BMGs. We have proposed a simple and effective approach, i.e., proportional mixing of binary eutectic compositions, for locating the glass former, and a new criterion for evaluating the glass-forming ability (GFA) of BMGs. We have reported the exceptionally high GFA of a FeCoCrMoCBY alloy which can be fabricated in the form of glassy rods with a maximum sample thickness of at least 16 mm, which is, to our knowledge, the largest critical thickness for glass formation, compared to those of any other Fe-based BMGs reported to date.



获得的国际上报道玻璃形成能力最强的Fe基大块非晶合金

Outer appearance and selected area electron diffraction pattern (inset) (left) and high resolution transmission electron microscope (HRTEM) image (right) of the 16-mm-diameter $Fe_{41}Co_7Cr_{15}Mo_{14}C_{15}B_6Y_2$ BMG



不同尺寸的Ti基非晶合金的压缩应力应变曲线(左)及X射线衍射图谱(右)

Compressive stress-strain curves (left) and XRD patterns (right) for Ti-based glassy sample with different diameters