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New primary pressure calibrants for high pressure and temperature scale: SiC-3C and cBN are possible candidates KIRILL ZHURAVLEV, ALEXANDER GONCHAROV, Carnegie Institution of Washington, VITALI PRAKAPENKA, University of Chicago — Since the invention of a diamond-anvil cell, various high-pressure scales for in situ pressure measurements have been realized. Ruby-based pressure scale (Mao et al., 1986) is the best known and high-pressure scientific community has been using it for over two decades. However, it has limited use at elevated temperatures, due to the weakening and broadening of the ruby fluorescence line. The recent developments in the field of high temperature, high pressure physics and geophysics require some alternative pressure scale, capable of measuring pressures at temperatures up to 3000 K. Cubic boron nitride (cBN) was recently proposed as the possible pressure calibrant. It has been suggested that the simultaneous use of x-ray diffraction to measure density and Brillouin spectroscopy to obtain elastic properties of the crystal can be used to construct the pressure scale independent of any other pressure standards. However, the acoustic velocities of cBN are very close to those of diamond and, therefore, are hard to resolve in experiment in diamond-anvil cell. Another possible primary pressure calibrant is cubic silicon carbide (SiC-3C). We performed single crystal x-ray diffraction and Brillouin spectroscopy up to 1 Mbar in pressure at room temperature in the diamond-anvil cell and show that cBN and SiC-3C, indeed, can be used in constructing reliable and accurate high-pressure, high-temperature scale.

Kirill Zhuravlev
Carnegie Institution of Washington

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