C_{ij}s of single crystal Pt under high pressure based on IXS and primary pressure scale

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There have been conflicts between previously proposed equations of state of platinum (Pt) in spite of importance of precise pressures under high pressure conditions. In order to determine independently EOS, the elastic constants of Pt, C_{11}, C_{12}, and C_{44}, were obtained based on inelastic X-ray scattering from ambient condition to *ca.* 20 GPa. The lattice parameters under high pressure conditions were measured simultaneously. Adiabatic bulk moduli and shear moduli were obtained from C_{ij}s and experimental pressures were calculated by integrating K_T(V). The EOS of Pt as a primary pressure scale was determined based on the experimental pressures. The pressures by our scale are 5 to 10 % lower than those of previous studies up to 200 GPa. Above 200 GPa, the present pressure scale shows up to 5 % higher pressures than pressures by the scales determined by XRD. On the other hand, our pressure scale shows 10 % lower pressures than those by the scales determined by shock data. In addition, the pressures based on the current scale show a good agreement those by Au scale obtained the same method, when pressures are calculated by using volumes of Pt and Au obtained simultaneously up to 140 GPa. On the other hand, the difference between pressures by previous Pt and Au scales become remarkable above 100 GPa.

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