Structure of Liquid Silver Halides at high pressures

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Pressure and temperature dependence of the structure of liquid silver halides AgX (X=Cl, Br, I) is investigated by a synchrotron x-ray diffraction up to 20 GPa by using SPEED1500 and MAX80 high-pressure apparatuses. The structure factor, S(Q), and the pair distribution function, g(r), of liquid AgI change drastically around 3 GPa and 11 GPa. At both pressures, the structural parameters, such as ratios in the position of the second peak to the first peak in S(Q) and g(r) abruptly change, as well as the significant increase in the coordination number. These show the existence of three stable liquid forms up to 20 GPa. The respective pressures where the drastic changes occur are almost the same as the transition pressures in the crystalline counterpart. The pressure-induced structural changes of AgX (X=Cl, Br, I) are compared and the pressure and temperature dependence of the structure of liquid silver halides are discussed.

The first-order phase transition-like phenomena in liquid silver halides are similar to those observed in liquid CdTe [1], while those are completely different from those in less ionic liquids, such as liquid Si[2], Ge[3], Sn[4], GaSb[5], InSb[6] and InAs [7]. The origin of the difference is discussed in the relation to the ionicity in the chemical bonds.

References:

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