Isolated versus Condensed Anion Structure VI: X-ray Structure Analysis and $^{81}$Br NQR of Guanidinium Pentabromodicadmate(II), [C(NH$_2$)$_3$]Cd$_2$Br$_5$, tris-Hydrazinium Pentabromocadmate(II), [H$_2$NNH$_3$]$_3$CdBr$_5$, and bis-Hydrazinium Tetrabromocadmate(II)-Tetra Hydrate, [H$_2$NNH$_3$]$_2$CdBr$_4$-4H$_2$O

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The structure of the condensed bromocadmate anions in [C(NH$_2$)$_3$]Cd$_2$Br$_5$ (1) and [H$_2$NNH$_3$]$_3$CdBr$_5$ (2) were studied at room temperature by X-ray diffraction. (1) crystallizes with double-chains bridged by Br atoms (orthorhombic, Pmmn, $Z = 2$, $a = 1394.0(5)$, $b = 394.5(1)$, $c = 1086.9(5)$ pm). This chain structure was not described previously. (1) shows three $^{81}$Br NQR lines at temperatures between 77 and 323 K. Structural phase transitions take place at 283 K and at 535 K. (2) crystallizes with Br bridged zigzag-chains (monoclinic, $P2_1$, $Z = 2$, $a = 943.1(1)$, $b = 778.8(2)$, $c = 942.0(2)$ pm, $\beta = 102.10(2)^\circ$) and shows a first-order phase transition around 304 K with a large thermal hysteresis. Below the transition point five $^{81}$Br NQR lines are observed at temperatures between 122 and 304 K, and above the transition point four $^{81}$Br NQR lines at temperatures between 288 and 353 K. Two $^{81}$Br NQR lines are observed in [H$_2$NNH$_3$]$_2$CdBr$_4$-4H$_2$O (3) at temperatures between 77 and around 320 K with positive temperature coefficients.

Key words: NQR; DSC; Crystal Structure; Phase Transition; Bromocadmate.