Salts of amino acids with a dimeric cation of the [A(1)$^{+}$···A(2)] type with polar symmetry

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Recently, we discovered a new class of salts containing different amino acids. The vast majority (47) of them are of a type [A(1)H···A(2)]X, where A(1) is protonated and A(2) zwitterionic amino acid: glycine (Gly), sarcosine (Sar), dimethylglycine (DMG), betaine (Bet), *β*-alanine (*β*-Ala), L-proline (L-Pro). X stands for Cl, Br, I, NO_3, BF_4, ClO_4 and NH_2SO_3 anions. The following dimeric cations were established: (GlyH···Sar), (GlyH···DMG), (SarH···DMG), (DMGH···Sar), (SarH···Bet), (BetH···Sar), (DMGH···Bet), (BetH···DMG), (L-ProH···Sar), (*β*-AlaH···Sar), (*β*-AlaH···DMG), (*β*-AlaH···Bet) and (*β*-AlaH···L-Pro). Sixteen of these salts crystallize with polar symmetry: [(SarH···DMG)BF_4, (SarH···DMG)ClO_4 - space group *Pc*)], [(DMGH···Sar)ClO_4 - s. g. *Pna*2$_1$], [(L-ProH···Sar)BF_4, (L-ProH···Sar)ClO_4, (L-ProH···Sar)NO_3, (L-ProH···Sar)Br, (L-ProH···Sar)I - s. g. *C*2], [(*β*-AlaH···DMG)I, (*β*-AlaH···DMG)BF_4, (*β*-AlaH···DMG)NH_2SO_3 - s. g. *Pna*2$_1$], [(*β*-AlaH···Bet)Br, (*β*-AlaH···Bet)I – s. g. *Cc*], [(*β*-AlaH···L-Pro)Cl, (*β*-AlaH···L-Pro)Br, (*β*-AlaH···L-Pro)I – s. g. *P*2$_1$]. The last three salts were described in our recently published article [1]. All these salts are potential pyroelectric or ferroelectric materials, the same as the recently reported ferroelectric (DMGH···DMG)Cl [2], as well as candidates for piezoelectric and nonlinear optics applications. Protonation in a pair of amino acids may depend on the anion, as in the cases of (SarH···Bet)ClO_4 and (BetH···Sar)$NH_2SO_3 \cdot 0.5H_2O$, (DMGH···Bet)$ClO_4 \cdot H_2O$ and (BetH···DMG)I.H_2O or, for the same anion, on the crystallization conditions, as in the case of (SarH···DMG)ClO_4 (crystallized from water solution) and (DMGH···Sar)ClO_4 (crystallized from acetic acid).

Work on the study of the properties of these salts is in progress.

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References

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