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NOVEL COMPOUNDS IN THE SYSTEM $M^{1+}M^{3+}(HAsO_4)_2$ (M^{1+} = Li, Na, K, Rb, Cs, Ag, Tl; M^{3+} = Al, Ga, In, Sc, Cr, Fe) – AN OVERVIEW

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Arsenates tend to form stable framework structures, similarly to phosphates and silicates. While the latter have been studied extensively and are used in a variety of technical applications, arsenates have been somewhat neglected so far although microporous arsenates, with promising zeolite-like properties together with superior thermal stabilities of up to 650 °C, have been reported (e.g. HUANG et al., 1999). Therefore, an extensive study in search of new compounds and structure types in the system $M^{1+}M^{3+}(HAsO_4)_2$ was initiated. $M^{1+}{}_2CO_3$, $M^{3+}{}_2O_3$, H_3AsO_4 und H_2O were used as starting materials for hydrothermal syntheses at 220°C (7 d, pH 0.5-2). The crystal structures of the following new, mixed T-O-framework-compounds were solved by single-crystal X-ray diffraction:

$TlFe(HAsO_4)_2$ (a = 7.346, b = 9.148, c = 9.662 Å, α = 64.89, β = 70.51, γ = 69.94, V = 538.6 Å^3, Z = 3) and α-$CsSc(HAsO_4)_2$ (SCHWENDTNER & KOLITSCH, 2004a) crystallize in the triclinic space group $P\bar{1}$. Both compounds are the first arsenates adopting the $(NH_4)Fe(HPO_4)_2$-structure type which was originally described by YAKUBOVICH (1993). A second Cs-Sc-arsenate, β-$CsSc(HAsO_4)_2$ (SCHWENDTNER & KOLITSCH, 2004a), is the first arsenate having the monoclinic ($P2_1/c$) structure type of $(H_3O)Fe(HPO_4)_2$ (VENCATO et al., 1989). The monoclinic compound $KSc(HAsO_4)_2$ (SCHWENDTNER & KOLITSCH, 2004b) represents a novel microporous structure type with space-group symmetry $C2/c$. The recently synthesized compound $AgGa(HAsO_4)_2$ (a = 7.826, b = 10.216, c = 8.694 Å, β = 107.77, V = 661.9 Å^3, Z = 4) crystallizes in the same structure type.

A further framework structure characterized by a very long c-axis is adopted by the following new hydrogenarsenates: $RbFe(HAsO_4)_2$, $RbGa(HAsO_4)_2$, $RbIn(HAsO_4)_2$, $CsIn(HAsO_4)_2$ ($R3c$, a = 8.425 / 8.385 / 8.512 / 8.629, c = 54.749 / 53.880 / 56.434 / 56.986 Å, V = 3365.5 / 3280.7 / 3541.1 / 3674.7 Å^3, Z = 18) are isotypic to $RbFe(HPO_4)_2$ (LII & WU, 1994) and represent the first arsenates crystallizing in this rhombohedral structure type.

All these arsenates form microporous mixed T-O-framework structures, which are characterized by intersecting tunnels containing the M^{1+}-cations. Therefore, further studies addressing the ion exchange properties of these novel compounds are planned. Investigations of the thermal stabilities as well as IR-spectroscopic studies will be discussed.

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