Syntheses and Crystal Structures of RE$_2$As$_4$O$_9$ (RE = Nd, Sm): Oxo-Arsenates(III) according to RE$_4$(As$_2$O$_5$)$_2$(As$_4$O$_8$) Exhibiting the Cyclic As$_4$O$_8^{4−}$ Anion

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Z. Naturforsch. 60b, 1219 – 1223 (2005); received September 8, 2005

Dedicated to Professor Gerhard Thiele on the occasion of his 70th birthday

Single crystals of light violet Nd$_2$As$_4$O$_9$ and yellow Sm$_2$As$_4$O$_9$ were obtained from the reactions of the respective lanthanide oxides with As$_2$O$_3$ in a NaCl flux at 850 °C in sealed silica ampoules. According to the structure determination, the triclinic compounds (P$ar{1}$, Z = 2, Nd/Sm: $a = 686.32(9)/680.92(9)$, $b = 763.06(8)/756.4(1)$, $c = 954.8(1)/951.2(1)$ pm, $\alpha = 96.83(1)^{\circ}/96.66(2)^{\circ}$, $\beta = 103.78(2)^{\circ}/103.67(2)^{\circ}$, $\gamma = 104.40(1)^{\circ}/104.35(2)^{\circ}$, $R1 = 0.0184/0.0282$ (all data)) have to be formulated as RE$_4$(As$_2$O$_5$)$_2$(As$_4$O$_8$) emphasizing the presence of both As$_2$O$_5^{4−}$ and cyclic As$_4$O$_8^{4−}$ anions. The As$_4$O$_8^{4−}$ anions show C$_4$ symmetry and connect layers of the composition \( \{_{2\infty}[\text{RE}_2(\text{As}_2\text{O}_5)]_2\}^{4+} \) along the [001] direction. The lanthanide ions are in nine- and eightfold coordination, respectively.

Key words: Lanthanides, Arsenites, cyclo-Tetraarsenite Anion