A New Mixed Valent Europium Chloride: Na₅Eu₇Cl₂₂
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Europium, Mixed Valence, Absorption Spectrum

The reaction of NaCl, EuCl₂ and EuCl₃ yields violet crystals of the new mixed valent chloride Na₅Eu₇Cl₂₂ which crystallizes with a hitherto unknown structure (orthorhombic, Pmmn, Z = 2, a = 2525.9(4), b = 846.91(9), c = 781.72(8) pm). The structure contains four crystallographically different europium ions, which can be attributed to Eu²⁺ or Eu³⁺ with respect to their coordination numbers and Eu-Cl distances. The [EuClₓ] coordination polyhedra are connected to chains along the [001] direction. Absorption spectra show transitions which can be assigned either to Eu²⁺ or Eu³⁺ ions or to intervalence charge transfer transitions (IVCT). The latter are at lower energy compared to other mixed valent europium chlorides. The occurrence of IVCT and the number of the crystal field levels of the Eu³⁺ ions reveal that the sites of the europium ions are occupied for a small amount by ions of the respective other valence.