Complexes of Magnesium Sulfate with Formamide

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Magnesium plays a significant role in the functioning of living organisms. More than 300 enzymatic systems are known in which magnesium ions act as cofactors [1]. Understanding the interaction between the magnesium cation and amide-type ligands is crucial for comprehending the role of magnesium in biological systems. Among simple amide ligands, the complexes of magnesium salts, particularly magnesium sulfate, with urea **(U)** have been the most studied [2-4]. In contrast, complexes with acetamide **(AA)** and formamide **(FA)** have been less explored.

In this study, the crystallization in the $MgSO_4$ – FA – H_2O system at room temperature led to the formation of two new compounds, which are magnesium sulfate complexes with formamide: $MgSO_4 \cdot FA \cdot 3H_2O$ and $MgSO_4 \cdot 3FA \cdot 2H_2O$ (Fig.1). The first compound is isostructural with the well-known crystal phase $MgSO_4 \cdot U \cdot 3H_2O$ [3], where the SO_4^{2-} anion is incorporated into the magnesium coordination octahedron, resulting in the formation of polymeric chains through the sulfate groups. The second phase lacks direct analogs in the magnesium sulfate-urea complexes. In this case, the sulfate ion also participates in the formation of the magnesium coordination octahedron but does not act as a bridging group, and no polymeric chains are formed. The closest structural analogy is the phase $MgSO_4 \cdot 4U \cdot H_2O$ [2], where the magnesium coordination octahedron consists of three formamide molecules and two water molecules in the formamide complex, and four urea molecules and one water molecule in the urea complex. In both cases, the coordination octahedron is complemented by the sulfate ion.

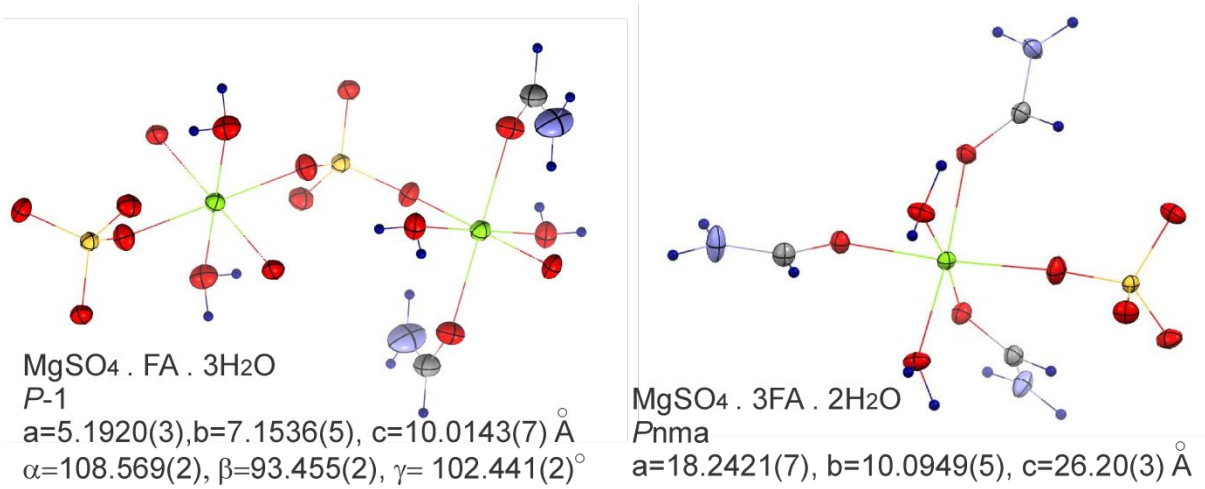

Figure 1. Crystal Structures of MgSO4 •FA • $3H_2O$ and MgSO4 • 3FA • $2H_2O$ complexes.

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