

LITHIUM INTERCALATION CLUSTER COMPOUNDS

A.V. Mischenko, Yu.V. Moronov, P.P. Samojlov,
V.E. Fedorov

Institute of Inorganic Chemistry,
Siberian Branch, Academy of Sciences
630090 Novosibirsk
USSR

The important group of inclusion compounds based on the early transition metal layer and channel type chalcogenides has been investigated. The problems of the formation of Li intercalates by interacting n-butyl lithium hexene solutions with Nb, Mo, W and Re chalcogenides have been considered.

Solid original matrices of different structural type have been selected in order to show the influence of the matrices-"host" electronic and geometric structure on the stoichiometry of the phases formed.

It has been established that the known regularity, - viz the intercalation capacity decreases in the sulfide-selenidetelluride range for the present transition metal-was observed for ordinary layer dichalcogenides with quasi-two-dimensional van-der-Waals gaps. The intercalation capacity for that type of compound increases due to the appearance of localized metal-metal interactions i.e. by the metal atoms clustering in the "host" structure. For example Li_3ReS_2 and $\text{Li}_1.66\text{ReSe}_2$ intercalates have been obtained for ReS_2 and ReSe_2 where rhombic Re_4 clusters are formed.

The other example of the metal-metal interactions influence on the intercalation capacity may be intercalates based on the Nb_3X_4 chalcogenides having separated lattice channels in the structure. These compounds form $\text{LiNb}_3\text{S}_4/1/$, $\text{Li}_2\text{Nb}_3\text{Se}_4$, $\text{Li}_0.4\text{Nb}_3\text{Te}_4$ intercalates on the basis of Nb_3X_4 that is evidence of the influence of both electronic and lattice factors on the compounds intercalation capacity.

The intercalation capacity depends weakly on the chalcogen nature for Mo_6X_8 compounds with octahedral metal-clusters and $\text{Li}_3.6\text{Mo}_6\text{S}_8/2/$, $\text{Li}_3.3\text{Mo}_6\text{Se}_8$, $\text{Li}_3.3\text{Mo}_6\text{Te}_8$ intercalates have been obtained.

The obtained phases were identified and their crystal and electronic structure characteristics have been studied.

References

1. Schollhorn R. *Angew.Chem.Int.Ed.Engl.*, v.19, 1980, p.983.
2. Schollhorn R., Kumpers M., Besenhord J.O. *Mater.Res.Bull.*, v.12, 1977, p.78.