Avis de Soutenance

Madame Ruiqi CHEN

Spécialité "Chimie des materiaux - UCCS"

Soutiendra publiquement ses travaux de thèse intitulés

Phases oxydes naturelles et synthétiques avec des f-éléments: recristallisation, chimie cristalline et propriétés

Cotutelle avec l'université "Université de Saint Petersbourg" (RUSSIE)

Soutenance prévue le ***mardi 17 décembre 2024*** à 15h30
Lieu : Dekabristov Lane, 16, 199155, Saint-Petersburg
Salle : 503

Composition du jury proposé

Mme Marie COLMONT	Université de Lille	Directrice de thèse
M. Angel AREVALO-LOPEZ	Université de Lille	Co-directeur de thèse
M. Oleg SIIDRA	Saint-Petersburg State University	Co-directeur de thèse
Mme Elena Solana MADRUGA	Universidad Complutense de Madrid	Examinatrice
Mme Céline DARIE	Grenoble INP –UGA University	Rapporteure
Mme Astrid HOLZHEID	University of Kiel	Rapporteure

Mots-clés : minéraux,matériaux,structure cristalline,propriétés magnétiques,

Résumé :

This study investigates six metamict minerals and a series of synthetic compounds. Radioactive minerals can mimic high-level waste and are a valuable subject of research. Samples of four mineral types – brannerite, davidite, fergusonite, samarskite, thorite, and zirconolite – were identified as metamict. Their mineralogical characteristics and chemical composition were thoroughly described and measured using electron microprobe analysis, and Raman spectroscopy... All mineral samples, when heated to 1200-1300 °C, recrystallized into expected structures, accompanied by the formation of new phases in different percentages. To discuss the mechanism of recrystallization, the processes of recrystallization and phase evolution were investigated using X-ray diffraction and thermal analysis. The thermal expansion of the crystallized minerals was studied, and the obtained thermal expansion coefficients contributed to the database of matrices for high-level waste disposal. Among the studied mineral structures, davidite, belonging to the crichtonite structural group, attracted interest in materials science due to its high chemical capacity. As part of this work, a series of compounds with the crichtonite structure were synthesized, and their magnetic properties were investigated. This study demonstrates the ferrimagnetic arrangement of Mn^{2+} and Ti^{3+} spins in CaMTO, SrMTO, BaMTO, CaFTO, and SrFTO. In contrast, LaMTO, CeMTO, NdMTO, LaMTFO, and SrMTFO exhibit spin glass behavior. These observations suggest that the incorporation of rare earth elements in the dodecahedral positions and iron in the octahedral positions disrupts the ferrimagnetic order within the AMTO crichtonite.