

THE EFFECT OF LITHIUM INTERCALATION ON THE LATTICE PROPERTIES OF ZrS_2

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ABSTRACT

ZrS_2 has been intercalated with lithium to study the change in the nature of the bond strength. The intercalation resulted in a change from semiconductor to metallic behaviour of the complex but the Debye temperature remained essentially invariant. The intercalated compound is superconducting below 2.8 K.

INTRODUCTION

There has been considerable interest in the structural, electrical, optical and superconducting properties of the transition dichalcogenides TX_2 ($T = Ti, Zr, Hf$ and $X = S, Se$). Most of these compounds have layered crystal structure and are well-known for the two dimensional character of their chemical bond strength. The interlayer bonding between X atoms is mainly ionic and partially covalent, depending on T. The ionicity of the bond is rather high if T belongs to group-IV and low if T belongs to group-VI, bearing a high covalent character. Thus the binding force between T-X is one or two orders of magnitude higher than the interlayer binding force. These weak interlayer interactions do not heavily affect the elec-