structure with the exception of Eu_2S_3 which does not exist (2), (6). The elements from La to Sm also form a series of compounds R_3S_4 with the same Th_3P_4 type cubic structure.

The R_3S_4 and R_2S_3 structures are the same except R_2S_3 has 1 1/3 rare earth metal vacancies per unit cell compared to R_3S_4, therefore no change in lattice parameter is found between the two types. This means there is a range of homogeniety R_2S_3 to R_3S_4 with no change in diffraction pattern so that X ray diffraction analysis can not be used to differentiate between the two types of compounds. There is, however, a considerable difference in density between the two structures. This effect has been observed for the lighter rare earths from La to Sm (2). Interestingly Eu_3S_4 is known but Eu_2S_3 does not exist (2). For the heavier rare earths of Gd, Tb and Dy the range of homogeniety is not observed and the R_3S_4 compounds do not exist for these rare earths (2), (6).

Guittard has shown that a range of NaCl type cubic homogeniety is found in the metal rich sulfides from RS to R_4S_3 for the heavy lanthanides from Tb to Tm. For Lu the NaCl type homogeniety is found from LuS to Lu_3S_4 but does not include Lu_2S_3 (18). Cutler has shown that the R_3S_4 compounds are metallic conductors while the R_2S_3 compounds are semiconductors or insulators. The rare earth furnishes electrons to the conduction band when it is present at a ratio higher than is necessary to satisfy the valence