

# Structural Studies on $\text{Ba}_2\text{SrMg}_4\text{F}_{14}$ and $\text{Ba}_2MM'\text{Mg}_4\text{F}_{14}$ ( $M = \text{Ca}, \text{Sr}, \text{Ba}$ )

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The new barium strontium magnesium fluoride  $\text{Ba}_2\text{SrMg}_4\text{F}_{14}$  has been prepared as an almost single-phase colorless powder by precipitating amorphous precursors and heating them at 650 °C. The compound crystallizes in the space group  $P4_2/mnm$  (no. 136) with  $a = 12.45514(4)$ ,  $c = 7.46092(3)$  Å,  $V = 1157.42(1)$  Å<sup>3</sup> and  $Z = 4$ . It is isostructural with the previously known Ca analog,  $\text{Ba}_{2.2}\text{Ca}_{0.8}\text{Mg}_4\text{F}_{14}$ . The structure is built up from a channel-forming network of tetrahedral  $(\text{MgF}_6)_4$  units linked by bridging fluorine atoms. The channels contain the  $\text{Ba}^{2+}$  ions (CN = 11) and  $\text{Sr}^{2+}$  ions (CN = 8,  $\text{CaF}_2$  type-related environment). Solid solutions with composition  $\text{Ba}_2(\text{Sr}_{1-x}\text{Ca}_x)\text{Mg}_4\text{F}_{14}$  with  $x = 0.13(1)$ ,  $0.36(1)$  and  $0.51(1)$  as well as  $\text{Ba}_2(\text{Sr}_{0.83(1)}\text{Ba}_{0.17(1)})\text{Mg}_4\text{F}_{14}$  were synthesized and characterized by powder X-ray diffraction.

*Key words:* Barium Strontium Calcium Magnesium Fluorides, Precursor Chemistry,  
Solid Solutions, Cluster-like Units