

SYNTHESIS AND CRYSTAL STRUCTURES OF $\text{Bi}_2\text{Ln}_4\text{O}_9$ MONOCLINIC PHASES

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Two monoclinic phases ($\text{Bi}_2\text{La}_4\text{O}_9$ and $\text{Bi}_2\text{Nd}_4\text{O}_9$) were synthesized in the binary system $\text{Bi}_2\text{O}_3\text{-Ln}_2\text{O}_3$ (Ln are rare earth element from La to Lu). No other monoclinic phases had been observed in the system. The reason was contributed to the decreasing ionic radius. The crystal structures had been determined by X-ray powder diffraction and refined by the Rietveld method. Figure 1 plotted the X-ray diffraction pattern of $\text{Bi}_2\text{Nd}_4\text{O}_9$. $\text{Bi}_2\text{La}_4\text{O}_9$ is isostructural with $\text{Bi}_2\text{Nd}_4\text{O}_9$. The compounds crystallize in monoclinic symmetry with a subcell space group of C2/m and $Z=2$. $\text{Bi}_2\text{Nd}_4\text{O}_9$ possesses the lattice parameters $a=6.7037(2)\text{\AA}$, $b=3.9062(1)\text{\AA}$, $c=3.9542(1)\text{\AA}$, and $\beta=125.258(1)^\circ$ while $\text{Bi}_2\text{La}_4\text{O}_9$ $a=6.8290(3)\text{\AA}$, $b=3.9887(1)\text{\AA}$, $c=4.0524(1)\text{\AA}$ and $\beta=125.094(3)^\circ$. The lattice parameters shrank with Ln radius. Rietveld refinement indicated that Ln and Bi randomly distributed on the cation site. In addition, the superstructure had been observed in the compounds. Figure 2 showed the electron diffraction pattern along $[100]$. The weak spots indicated a triple superstructure along $[001]$. The superstructure was more noticeable in $\text{Bi}_2\text{Nd}_4\text{O}_9$ than in $\text{Bi}_2\text{La}_4\text{O}_9$. The existence of the superstructure can explain the large isothermal temperature factors in this kind of compounds.

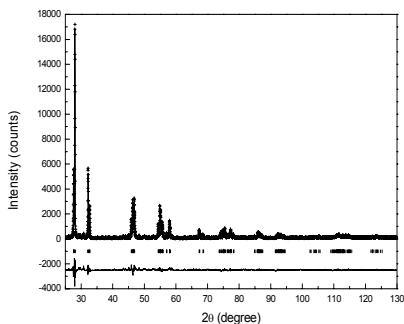


Figure 1

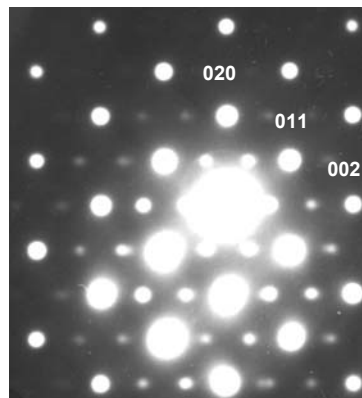


Figure 2