Comparative study of the formation and stability of single crystal $La_2O_2CO_3$ materials

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The different single crystal $La_2O_2CO_3$ phases are one of key parameters influencing heterogeneous catalytic behavior of La_2O_3-containing catalysts. In this study, we prepared single crystal $La_2O_2CO_3$ materials by different methods and comparatively investigated the formation of $La_2O_2CO_3$ phases in the prepared materials along with a theoretical calculation. The conventional precipitation method at room temperature generated the monoclinic $La_2O_2CO_3$ structure while the ethylene glycol combustion method and the hydrothermal method brought the hexagonal $La_2O_2CO_3$ phase. The formation of the hexagonal phase would be due to continuous gas releasing in the ethylene glycol combustion method and the limited supply of CO_2 gas in the hydrothermal method. In contrast, the stable and continuous supply of CO2 gas at room temperature in the precipitation method could form the more stable monoclinic $La_2O_2CO_3$ structure, which was confirmed by an additional theoretical calculation.