CONCLUSION

The as-prepared gels for $LaCoO_3$ formation produced from the Pechini, the Schiff base complex and the coprecipitation methods were characterized by infrared spectroscopy (IR). Results from both sol-gel methods showed that both lanthanum ion and cobalt ion formed complexes before calcinations. The formation of $LaCoO_3$ with the crystallite sizes of 12 – 13 nm took place upon calcination at 773 K for 8 hours which was identified by both IR and x-ray diffraction (XRD). IR spectroscopy revealed the presents of CO_3^{2-} and NO_3^- on the sample surfaces during heat treatment resulting vacant sites for oxygen to adsorb after formation of gaseous compounds. In the coprecipitation, firstly cobalt oxide was formed and transformed to $LaCoO_3$ perovskite at 823 K, resulting much oxygen in the lattice of perovskite structure. At 973 K, the $LaCoO_3$ perovskite had the crystallite sizes of 23.1 nm with $La(OH)_3$ as impurities.

From the XPS results, the binding energies of La^{3+} (835.9 – 836.9 eV for La $3d_{5/2}$ and 852.9 – 853.8 eV for La $3d_{3/2}$) and Co^{3+} (780.1 – 780.3 eV for Co $2p_{3/2}$ and 795.5 – 795.7 eV for Co $2p_{1/2}$) were observed in all prepared catalysts. The binding energies of oxygen were observed at 529.8-530.4 eV and 532.5-532.8 eV corresponded to lattice (β) oxygen and adsorbed (α) oxygen, respectively. The samples prepared by both sol-gel methods had higher numbers of peak area ratios than those prepared by the coprecipitation. This could be explained by a higher diffusion barrier of the La^{3+} and Co^{3+} ions for the samples from the sol-gel method caused by the organic ligand forming less crystallinity of the perovskite with higher ratios of adsorbed oxygen to lattice oxygen.

DRIFTS study of toluene oxidation on prepared $LaCoO_3$ showed that both sol-gel methods produced low crystallinity perovskite with high ratio of adsorbed oxygen to lattice oxygen and performed favorable in the catalytic oxidation of toluene. $LaCoO_3$ prepared by sol-gel method using the Schiff base complex performed higher catalytic activity than that prepared by the Pechini due to the higher ratio of adsorbed oxygen to lattice oxygen