Effect of Ba precursors on the formation of BaCO$_3$ supported granular alumina for lean NOx trap

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BaO and BaCO$_3$ are well known as NOx storage material for lean burn engine where the air to fuel ratio is high and subsequently the reduction of NOx cannot be achieved completely. Under such circumstance, the NOx is believed to be stored as Ba(NO$_3$)$_2$. The storage or sorption process should be occurred within 30−120 sec while the regeneration takes place in 1−10 sec. Therefore, the size and location of BaO or BaCO$_3$ is very important in determining the kinetics of the lean NOx trap. In this work, we have investigated the effect of the Ba precursors on the formation of Ba sorption site. Among various precursors, BaCl$_2$.2H$_2$O was converted into BaO phase containing CO$_3^{2-}$ as adsorbed species at lowest temperature around 423 K while Ba(HCOO)$_2$.xH$_2$O was transformed to BaCO$_3$ above 700 K. With the increase of the activation temperature, the portion of chemically bound species was increased compared to that of the physically adsorbed species while the total amount of CO$_3^{2-}$ species was decreased due to the increase of the BaO island or BaAlO$_2$ portion which was confirmed by the results of FT−IR and X−ray diffraction.