University of Salerno
Department of Chemistry and Biology

Ph.D Course in Chemistry
(XIII Cycle)

ENVIRONMENTAL AND CATALYTIC APPLICATIONS OF ALKALINE OXIDES

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Abstract

Alkaline oxides are widely used in industrial processes involving removal of gaseous compounds as unwanted by-products such as CO_2, hydrogen sulphide and nitric oxides. Traditional processes generally involve Ca-based sorbents for their high performances also at high-temperature, high availability, low costs and good recyclability in subsequent adsorption/desorption cycles.

Recently, interest about the use of new alkaline oxides in catalysis has increased considerably due to extraordinary discovery of an high active metal oxide namely mayenite, $Ca_{12}Al_{14}O_{33}$, able to take active part in catalytic reactions such as biomass steam reforming and nitrous oxide removal from the process gas of nitric acid plants.

Based on high reactivity of Ca-based sorbents towards gaseous acidic molecules, the first part of this thesis is dedicated to the employment of Ca-based sorbents in environmental devices, passive samplers, in order to evaluate their applicability as CO_2 and NO_x sorbents.

Moreover, the use of $Ca_{12}Al_{14}O_{33}$ as active support in catalysis is investigated in hydrogenation reactions comparing activity in terms of conversion and selectivity with those of commercial catalysts.