Heterogeneous catalytic decomposition of nitrous oxide.

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Nitrous oxide (N_2O) is recognized as very harmful in destroying the stratospheric ozone layer. The Kyoto protocol of the United Nations Convention on Climate Change (December 1997) states that N_2O is a second non-CO_2 greenhouse gas. It has been reported that N_2O has 310 and 21 times the global warming potential of CO_2 and CH_4, respectively. N_2O is also known to contribute to catalytic stratospheric ozone layer destruction.

The human contribution of the N_2O emission to the atmosphere is estimated to be 4.7-7 million ton per year, about 30-40% of the total emission. Some of the sources are nitric acid manufacturing, fossil fuels and biomass combustion, plus land cultivation. Unfortunately N_2O is also formed by selective catalytic reduction of NO_x. If the atmospheric N_2O is to be stabilised, there has to be a 70-80% reduction of the human emission. As it is now, there are no legislations on the emission of N_2O. It is though believed that it soon will come because of the growing governmental awareness, of the environmental impact of emission gasses. Emission reduction of N_2O can be achieved in different ways. One of them is after-treatment, end of pipe solutions. A possible after-treatment is catalytic decomposition of N_2O into the harmless gasses N_2 and O_2. This reaction has been known for some time, and many catalysts have been tested for the decomposition. Still no promising catalyst has yet been found. For the catalyst to be suitable for industrial application, it needs to operate at relatively low temperature (under 300^oC), must not lose activity over time, have low cost in the making and of course have a high conversion of N_2O.

In this project, different catalysts have been prepared and analysed for their activity in this decomposition of N_2O, under conditions given by the industry. Among them are cesium doped cobalt-oxide spinels plus iron and cupper modified zeolites. All the catalysts was analysed with different quantities of the impregnated material. This was done to find the optimum ratio of the support and for further analysing. The goal of this project is to find catalysts suitable for industrial application.