Adsorption of H_2O and CO_2 on Fe_3O_4 surfaces

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Magnetite (Fe_3O_4) iron oxide received much attention in modern technologies because of its unique electronic and magnetic properties [1]. Magnetite is an important material in geophysics, mineralogy, and catalysis, where many chemical reactions take place in water containing environment. Water adsorption (molecular or dissociative) may result in a variety of hydroxyl groups which may, in turn, affect the surface chemistry. Adsorption and transformation of carbon dioxide (CO_2) is also important elementary step in several catalytic reactions on oxides such as, for instance, reverse water gas shift reaction.
In this study, we investigated adsorption and co-adsorption of water and CO_2 on (111) and (001) surfaces of Fe_3O_4 by temperature programmed desorption (TPD) using well-ordered thin films grown on Pt(111) and Pt(001) substrates, respectively, under well-defined conditions. In addition, the formation of long-range ordered water ad-layer on both surfaces was examined by low energy electron diffraction (LEED). The experimental results revealed some similarities as well as strong differences thus suggesting that water and CO_2 adsorption on magnetite (111) and (001) surfaces is structure sensitive.

References:
[1] G.S. Parkinson *"Iron Oxide Surfaces"*. Surf. Sci. Rep. **71,** 272 (2016).