The use of synchrotron radiation in industrial catalysis research

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As a catalyst producer, Haldor Topsøe is continuously striving to extend the competencies and fundamental understanding within catalysis. This knowledge enables us to rationally design new, improved catalysts and to move the boundaries for industrial catalyst performance. Despite their solid nature, under reaction conditions, heterogeneous catalysts are structurally very dynamic systems. Therefore, our approach has always focused on the necessity to monitor a catalyst at its actual "working environment" to catch these structural dynamics and get a picture of the real active structure. We have been pioneering the use of synchrotron radiation in catalysis research since the late 1980's and continue to do so today, as it represents a unique possibility to obtain an atomic scale understanding of the active sites involved in the target reaction.

In this lecture, I will summarize some of the most important and recent results of the work we have been doing internally and in collaboration with different academic groups over the past 40 years. I will cover examples from in-house developments within catalysis for environmental and synfuel applications as well as for the production of bulk chemicals. The applied methods will range from classical XAS experiments and advanced synchrotron techniques to new developments.