Understanding TiO_2 Nanowire Growth for Real-World Applications

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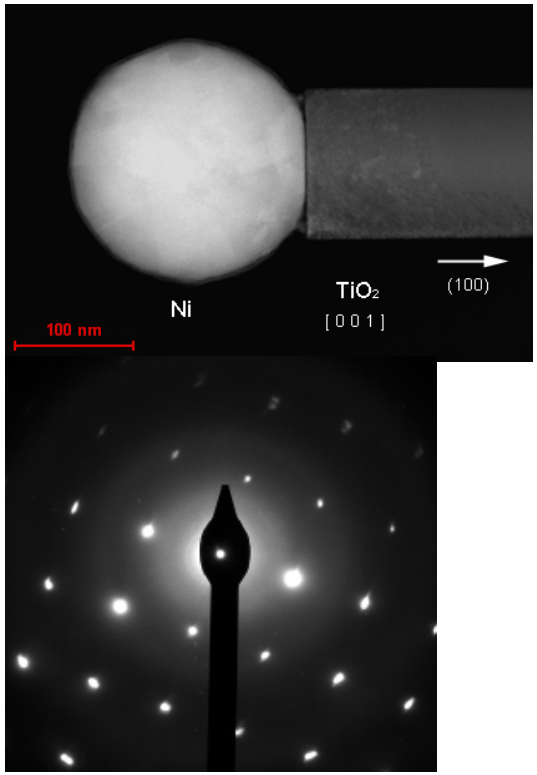
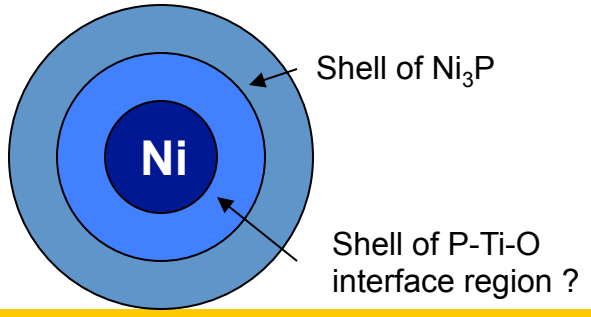
Supported by the National Science Foundation





Recent investigation of metal oxides such as V_2O_5, WO_2, and TiO_2highlight these materials as potential catalysts for lower temperature methane activation and gas sensing devices. However, the controlled large scale growth of metal oxide nanowires is still a limiting factor to their application in real world energy conversion. For example, typical nanowire synthesis methods include atmospheric-pressure chemical vapor deposition (APCVD) but the mechanism for optimizing growth conditions is difficult as their growth mechanism is still the subject of much debate. Recently, SEM and TEM analysis of TiO_2 nanowires fabricated in the Wodtke lab by APCVD revealed the formation of Ni_3P catalyst particles and demonstrated the strong positive influence of phosphorous (P) on nanowire synthesis. As a result, I have worked closely with Dr M.W. Kim (Dr Alec Wodtke's group) and Dr C T. Yavz (Dr Galen Stucky's group) over the past year to investigate how the presence of phosphorous in APCVD nanowire growth influences the vapor-liquid-solid (VLS) mechanism for TiO_2 and how to optimize the amount of phosphorous needed for bulk nanowire production. The next step will be to perform hydrogen gas sensing experiments using our fabricated metal-oxide nanowires.

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