



## **MAX-phase materials**

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MAX-phase materials is a group of materials which is nanolaminar in structure and is a cross between ceramic and metallic. There exist about fifty different materials in this group. They combine high stiffness with machinability, even after sintering. Further benefits compared to traditional ceramics is better resistance to thermal shock and wear resistance.

For example titanium silicon carbide has a unit cell with silicon layers between which titanium-carbon-octaeders is found. The unit cell is about ten Ångström in size and a molecule consists of three titanium, one silicon and two carbon atoms.

Currently my research is focused on finding the paramters of a chemical process for producing titanium silicon carbide:

The process involves mixing of titanium, silicon and carbon tetrachloride in a solvent. We make this react with sodium to loose the chloride by the forming of sodium chloride, regular table salt. This will give a solution with free titanium, silicon and carbon. Vacuum distillation is done to remove the solvent and obtain a precursor powder. Finally to remove the salt and unreacted sodium we do vacuum sublimation and further heat treatment. The quality of the resulting powder is checked using X-ray diffraction, SEM and TEM.