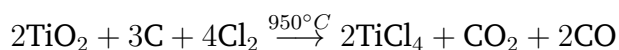


2019 CHEM2C: Assignment 5

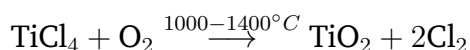
Ram Seshadri (seshadri@mrl.ucsb.edu)

Due date: May 16 2019 (in class). Keep everything brief. Respect significant figures and units.

1. Provide the electronic configuration across the series Sc ... Cu and explain the rules.
2. Provide the electronic configuration of the divalent cations across the series Sc²⁺ ... Cu²⁺ and explain the rules.
3. Explain the notion of shielding and use this to explain the approximate trend across the series Sc ... Cu, for:
 - (a) The first ionization energy
 - (b) Atomic size
 - (c) The highest oxidation state
4. Explain this trend in atomic radii: Ti 1.477 Å, Zr 1.593 Å, and Hf 1.476 Å.
5. Consider the preparation of pure TiO₂ particles (for use as pigments) from less pure TiO₂ through the reactions presented below, and answer the questions that follow:



and



- (a) What is the driving force for first reaction?
- (b) What are the oxidation states of the different components in first reaction? Identify what is oxidised, what is reduced, and what stays the same.
- (c) What does the second reaction tell you about the relative preference of Ti for O *versus* Cl?