Hard and ultra-incompressible materials are of great interest due to their usefulness in industry application. A common route to find hard materials is combining light small covalent elements with transition metals. Light elements like carbon, boron and nitrogen have been considered as good candidates. In this study, ReB\textsubscript{2} were mechanochemically synthesized. This method avoided using excessive B, which can degrade the mechanical properties of ReB\textsubscript{2}. Also, the hexagonal OsB\textsubscript{2} was first synthesized by the mechanochemical way. Another promising hard material, AlMgB\textsubscript{14}, was also studied in this thesis.

Major: Mechanical Engineering/Mechanical Systems

Educational Career:
Bachelor's of Mechanical Engineering, BS, 2010, China University of Petroleum

Committee in Charge:
Nina Orlovskaya, Chair, MMAE
Richard Blair, Co-Chair, Chemistry
Seetha Raghavan, MMAE
Jan Gou, MMAE

Approved for distribution by Nina Orlovskaya, Committee Chair, on March 6, 2012.

The public is welcome to attend.