机械与动力工程学院博士生资格考试笔试大纲

Syllabus of Ph.D. Qualification Examination (SJTU-ME)

*笔试主题 Exam Topic	（中文） 反应堆材料学 （English） Nuclear Reactor Materials
*考核形式 Exam Format	闭卷考试，1 小时 Closed-book exam, 1 hour
*考核目标 Exam Target	(1) 考察研究生对反应堆材料基础知识掌握的程度，重点考察水冷对材料方面的内容； (2) 分析问题解决问题的能力； (3) 新型反应堆及关键核级材料未来的发展趋势。 (1) Examine the basic knowledge of reactor materials , emphasing on the materials for water cooled power reactors; (2) Ability to analyze and solve problems; (3) The future development trend of new reactor design and key nuclear grade materials.
*考核内容 Exam Contents	(1) 材料的成分、晶体类型、组织结构与材料性能的关系；The correlation of materials performances with chemical compositions, crystal structure and microstructures. (2) 金属材料的强化机理、典型压水堆核电厂主要设备、堆内结构所用的材料及其性能特点；Strengthening of materials, materials for PWR power reactors, including nuclear grade equipment such as primary piping, pressure vessels and internals. (3) 有机、无机氧化物、金属等工程材料在γ射线和快中子辐照条件下的辐照损伤机理及对材料性能的影响规律；Radiation damage to reactor materials. (4) 金属材料在核电厂高温高压水、辐照环境下的腐蚀机理；Corrosion and radiation damage of reactor materials. (5) 核燃料、包壳材料、堆内构件、反应堆压力容器、主冷却剂管道、蒸汽发生器传热管等核电厂主要设备及部件的选材原则、材料强化机制、在核电厂工况下的老化及失效机理、防范措施等；Materials for nuclear fuel, cladding, internals, pressure vessels, primary coolant piping, steam generators, their performances, degradation and mitigation of failure. (6) 先进反应堆材料的发展。Development of materials for future advance reactors.
*参考书目 References	**(1)** 自编讲义，张乐福，上海交通大学教材科，电子版下载地址： ftp://lfzhang:public@public.sjtu.edu.cn/%B1%BE%BF%C6%B

	A%CB%B2%C4%C1%CF/. **(2)** 杨文斗，《反应堆材料学》，原子能出版社，北京 **(3)** [美] Olander,D.R.，Fundamental Aspects of Nuclear Reactor Fuel Elements, Technical Information Center of Public Affairs, Energy Research and Development Administration，1976 **(4)** 材料课讲义，下载地址：ftp://lfzhang:public@public.sjtu.edu.cn/for%20masters/
备注 Notes	