Investigation of Laboratory Produced ODS Alloys

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Abstract. Irradiation, heat and mechanical stresses are factors which influence structural materials of nuclear power plants (NPP), e.g. reactor pressure vessel steels and may reduce lifetime of NPP operation [1-3]. High radiation and thermal loads are expected in the newest generation of nuclear power plants, such as Generation IV (GEN IV) and fusion reactors, which will be operated at temperatures between 550 - 1 000 °C and will be exposed to irradiation over 100 DPA during planned lifetime (more than 60 years) [4]. Consequently, the demands on their structural materials are very high and so the research and development needs to be focus on their improved characteristics. The advanced structural materials, as oxide-dispersion-strengthened (ODS) steels, are developed for application in cooling systems, reactor pressure vessel or fuel cladding of the GEN IV nuclear power plants. The ODS steels fulfill demands on radiation, thermal and mechanical resistance during operation of nuclear reactor. ODS steels have high thermal corrosion resistance based on alloying by chromium, aluminum, silicon and based on formation of dispersion of stable oxides (Y_2O_3) in structure. The experiments in this paper are focused on the laboratory produced model ODS alloys. The experimental analysis of materials at microstructural level was performed by Pulsed Low Energy Positron System and the nanoindentation system.