

## Grain Refinement of Zry-4 As Cast by Cold Working and Annealing

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### Abstrak

Purpose of Research (specific objective and/or statement of hypothesis in around 300 to 400 words. Please try to avoid using an additional page).

Zry-4 is an alloy of Zirconium (Zr) with alloying elements of Fe, Cr, and Sn with weight percentage of 0.2%, 0.07% and 1.5% respectively. This alloying element addition is intended to improve the mechanical properties as well as Zirconium, that is corrosive resistance at high temperature.

Besides the alloying elements, the micro structural morphology of Zry-4, as results of thermomechanic treatment process, also an active role to determine mechanical, physical and corrosion properties. This alloy is used as structure and cladding materials for Pressurized water Reactor (PWR) nuclear fuel element. Zirconium alloy of Zr-702 will also be used for chemical engineering devices due to its high corrosion resistance in acid and alkali liquid as well as at high temperature. Examples of device are : Distillation Column, Reactor, Pump Housing and Heat exchanger and Heating coil due to mechanical properties at high temperature.

Some researchs have been done previously to observe changes of mechanical and corrosive properties of Zry-4 with solution treatment  $\theta$ -phase, but unfortunately they are not continued between deformation degree and grain size with new precipitate is obtained. In this research we plan to carry out a cold deformation process of  $\theta$ -quenching result and be continued with annealing process. From the process results we will observe the morphology of micro structure of Zry-4.

This process will enable to determine the deformation level, time and temperature annealing to obtain a certain microstructure according to the desired mechanical properties (Microhardness).

Results of research can hopefully be used as input in the working process of Zry-4. Optical Microscopy, Transmission Electron Microscopy and X-Ray Diffraction will be used in the microstructure observation.