and forms at higher temperatures and has a body center crystal structure cubic (bcc). Phase changes α to γU phases are carried out by heating or adding metal elements at high temperatures then cooled to room temperature. Through the addition of metal elements at high temperatures, the γU phase formed at high temperatures will remain even though the alloy temperature is cool. A change also follows this phase change in the crystal structure from the original phase α has an orthorhombic structure that will change to the γU phase, which has a cubic structure. Meanwhile, UO_2 compounds are formed due to the oxidation of the U-Zr-Nb sample either during the hydriding-dehydriding process or after the hydriding-dehydriding process, where the U-Zr-Nb sample is stored in an open place and in contact with air.

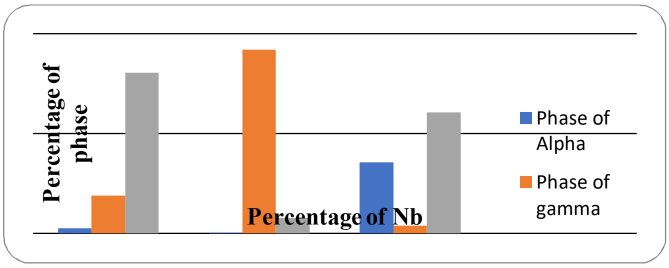

Fig. 6 Phase composition with Nb variation content in the U-Zr-Nb powder

When compared with U-6Zr-2Nb, U-6Zr-5Nb, and U-6Zr-8Nb alloys in the form of ingots (before hydriding-dehydriding), it can be seen that U-6Zr-2Nb alloy ingots have αU and γU phases, ingot alloy U-6Zr-5Nb has αU, γU, and δ1 (UZr2) phases, U-6Zr-8Nb alloy ingots have αU, γU, and δ1 (UZr2) phases. Both U-6Zr-5Nb alloys, both ingots and powders have the same phases of U when in the same conditions. The αU phase appears at an angle of 2θ respectively at 35.4, 38.6, 52.05, and 65.01 °, the γU phase formed at an angle of 2θ respectively at 35.64, 59.8, and the 76 ° while phase δ1 (UZr2) is formed at an angle of 2θ at 26.67 °. The results are not different from the two forms, namely powder, an ingot, where they produce the αU and γU phases. Both of these results are also following previous research of making U-Zr-Nb alloys that obtained αU, γU, and δ1 (UZr2) phases[15],[16].

IV. Conclusion

The results of the analysis of U content in the U-6Zr-2Nb, U-6Zr-5Nb, U-6Zr-8Nb alloy powder samples were 89.307, 85.568, and 83.553 wt%, while the Zr content analysis obtained successive results amounted to 6.220, 5.829, and 6.192 wt%. Meanwhile, in the analysis of Nb in U-6Zr-2Nb alloy powder, U-6Zr-5Nb, U-6Zr-8Nb obtained successive results amounted to 2.023, 5.04, and 8.155 wt%. The recovery results on each U-6Zr-2Nb alloy powder, U-6Zr-5Nb, U-6Zr-8Nb between 96.144 to 99.833 %, and a low accuracy rate between 0.002 to 0.029 %. From the analysis of impurity elements, it was found that the elements Al, Mn, Cu, and Fe exceeded the requirements. The phase analysis results were obtained for each sample U-6Zr-2Nb, U-6Zr-5Nb, U-6Zr-8Nb contained αU, γU, and UO_2 compounds, where the γU phase was the dominant phase. The highest γU phase content is found in U-6Zr-5Nb, which is 92.108 wt%, and after the Nb content exceeds 5 wt%, the greater addition of Nb does not increase the number of γU phases formed.

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