Characteristic of Specimens of Irradiated and Unirradiated Fuels

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1. Introduction

The nuclear fuels in nuclear reactors takes place structure changes of nuclear fuels through swelling and densification. PIEs(post irradiation examination) were carried out to evaluate behavior and integrity of irradiated nuclear fuels[1-4]. The structures of nuclear fuels were analyzed through destructive examinations of irradiated nuclear fuels[5-6]. In this study, specimens of unirradiated and irradiated nuclear fuels which are burned in Kori 1 and Kori 2 unit were prepared to investigate their characteristics. The grinding and polishing thickness of specimens were measured. The grinding and polishing thickness of unirradiated and irradiated nuclear fuel rods were analyzed on grinding time and polishing time, grit size of grinding and particle size of polishing.

2. Examination

Specimens of unirradiated and irradiated nuclear fuel rods which are burned in Kori 1 and Kori 2 unit were prepared through grinding operation of grit 120, 240, 320, 400 and 600 for 30 minutes including speed 150 rpm of grinding machine and load 600 gram gravity and polishing operation of diamond paste 15, 9 μm under the same as conditions of grinding operation. Specimen thicknesses of unirradiated and irradiated nuclear fuel rods were measured by vernier caliper. The grinding and polishing thickness of unirradiated and irradiated nuclear fuel rods were analyzed on grinding time and polishing time, grit size of grinding and particle size of polishing.

3. Results Analysis and Discussion

Figure 1 shows grinding thicknesses of unirradiated and irradiated nuclear fuel rod of Kori 1 and Kori 2 unit through grinding operation of grit 120 on grinding time under speed 150 rpm of grinding machine and load 600 gram gravity. Grinding thicknesses indicated increasing trend as grinding time increases. Grinding thicknesses of irradiated nuclear fuel rods were slightly bigger than those of unirradiated nuclear fuel rods. Grinding thicknesses of unirradiated nuclear fuel rods indicated 500 μm, while those of irradiated nuclear fuel rods indicated 600 μm. Figure 2 shows grinding thicknesses of unirradiated nuclear fuel rod and irradiated nuclear fuel rod through grinding operation of grit 240 on grinding time. Grinding thicknesses indicated increasing trend as grinding time increases.

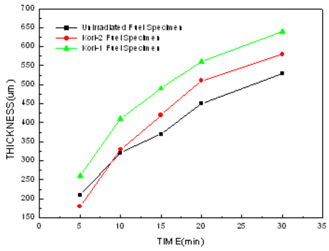

Figure 1. Grinding thickness of specimens of unirradiated and irradiated fuel rods on grit 120.

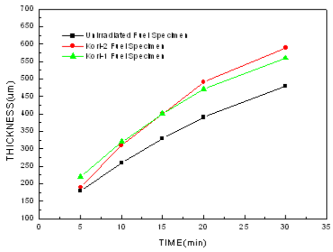

Figure 2. Grinding thickness of specimens of unirradiated and irradiated fuel rods on grit 240.

Figure 3 shows grinding thicknesses of unirradiated nuclear fuel rod and irradiated nuclear fuel rod through grinding operation of grit 320 on grinding time. Grinding thicknesses indicated increasing trend as grinding time increases. Grinding thicknesses of irradiated nuclear fuel rods were bigger than those of unirradiated nuclear fuel rods. Grinding thicknesses of unirradiated nuclear fuel rods indicated 400 μm, while those of irradiated nuclear fuel rods indicated 500 μm. Figure 4 shows grinding thicknesses of unirradiated and irradiated nuclear fuel rod through grinding operation of grit 400 on grinding time.

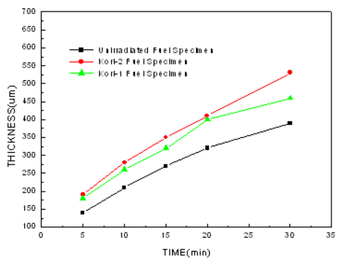

Figure 3. Grinding thickness of specimens of unirradiated and irradiated fuel rods on grit 320.

Grinding thicknesses indicated increasing trend as grinding time increases. Grinding thicknesses of irradiated nuclear fuel rods were bigger than those of unirradiated nuclear fuel rods. Figure 5 shows grinding thicknesses of unirradiated and irradiated nuclear fuel rod through grinding operation of grit 600 on grinding time.

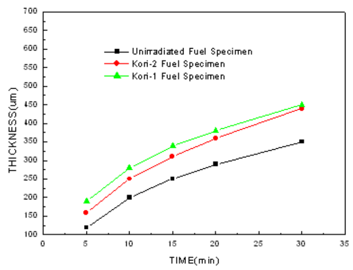

Figure 4. Grinding thickness of specimens of unirradiated and irradiated fuel rods on grit 400.

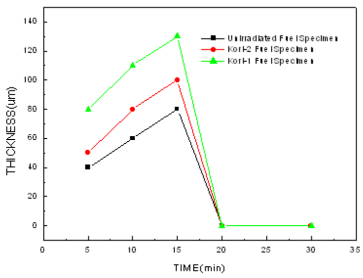

Figure 5. Grinding thickness of specimens of unirradiated and irradiated fuel rods on grit 600.

Grinding operations of unirradiated and irradiated nuclear fuel rods above 15 minutes of grinding time were not progressed. Figure 6 shows polishing thicknesses of unirradiated nuclear fuel rod and irradiated nuclear fuel rods through polishing operation of diamond paste 15 µm on polishing time. Polishing thicknesses of unirradiated and irradiated nuclear fuel rods on 15 minutes of grinding time were about 90 µm. Polishing operations of unirradiated and irradiated nuclear fuel rods above 15 minutes of polishing time were not progressed. Figure 7 shows polishing thicknesses of unirradiated nuclear fuel rod and irradiated nuclear fuel rod through polishing operation of diamond paste 9 µm on polishing time.

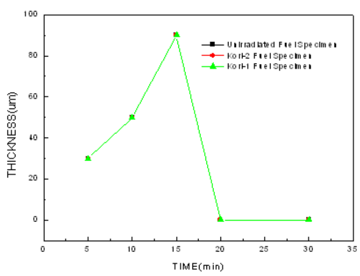

Figure 6. Polishing thickness of specimens of unirradiated and irradiated fuel rods on particle size 15µm of diamond paste.

Polishing operations of unirradiated and irradiated nuclear fuel rods above 15 minutes of polishing time were not progressed. Polishing thicknesses of unirradiated and irradiated nuclear fuel rods on 15 minutes of grinding time were about 30 µm.

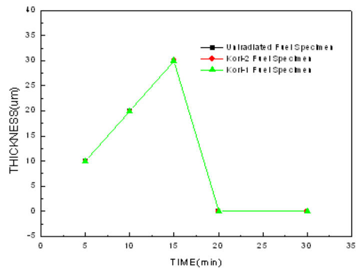

Figure 7. Polishing thickness of specimens of unirradiated and irradiated fuel rods on particle size 9 µm of diamond paste.

4. Conclusion

Grinding thicknesses of irradiated nuclear fuel rod on grit size were bigger than those of unirradiated nuclear fuel rod under speed 150 rpm of grinding machine and load 600 gram gravity. Grinding operations of unirradiated and irradiated nuclear fuel rods through grit 120, 240, 320 400 for 30 minutes including through grit 600 above 15 minutes of grinding time, were not progressed. Polishing operations of unirradiated and irradiated nuclear fuel rods through diamond 15, 9 µm for 15 minutes under speed 150 rpm of grinding machine and load 600 gram gravity, were not progressed.

References

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