1. Contents

- **Fine particle shot peening (FPSP) technology**
  - Technology, features
- **Basic fatigue properties of A7075 by FPSP**
  - S/N data and residual stress compared with conventional shot peening (SP) technology
- **Fatigue properties of FPSP A7075 followed by BSAA**

  BSAA: Boric Sulfuric Acid Anodize
  - Influence of anodizing after FPSP and SP
  - SEM observations of surface, cross section and fracture cross section
- **Summary**

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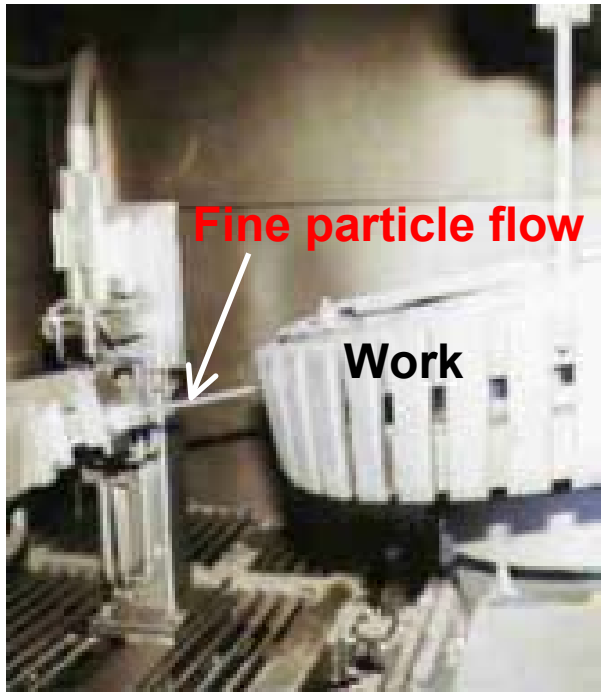
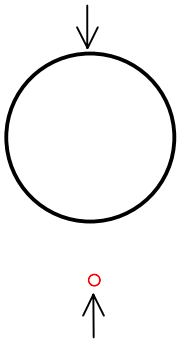
2. Fine particle shot peening (FPSP)



Conventional shot peening particle ex. 0.8mm



Fine particle About 0.05mm

Method:

Shot peening by fine particle of ceramics or hard steel etc. (5 to 200μm) with high velocity (up to 200m/s)

Features:

- High compressive stress at very near surface with very limited surface damage
- Good tribological property
- Can be combined with other surface technologies
- Creation of surface nano-layer

FPSP technology is mainly applied for automobile industry in Japan

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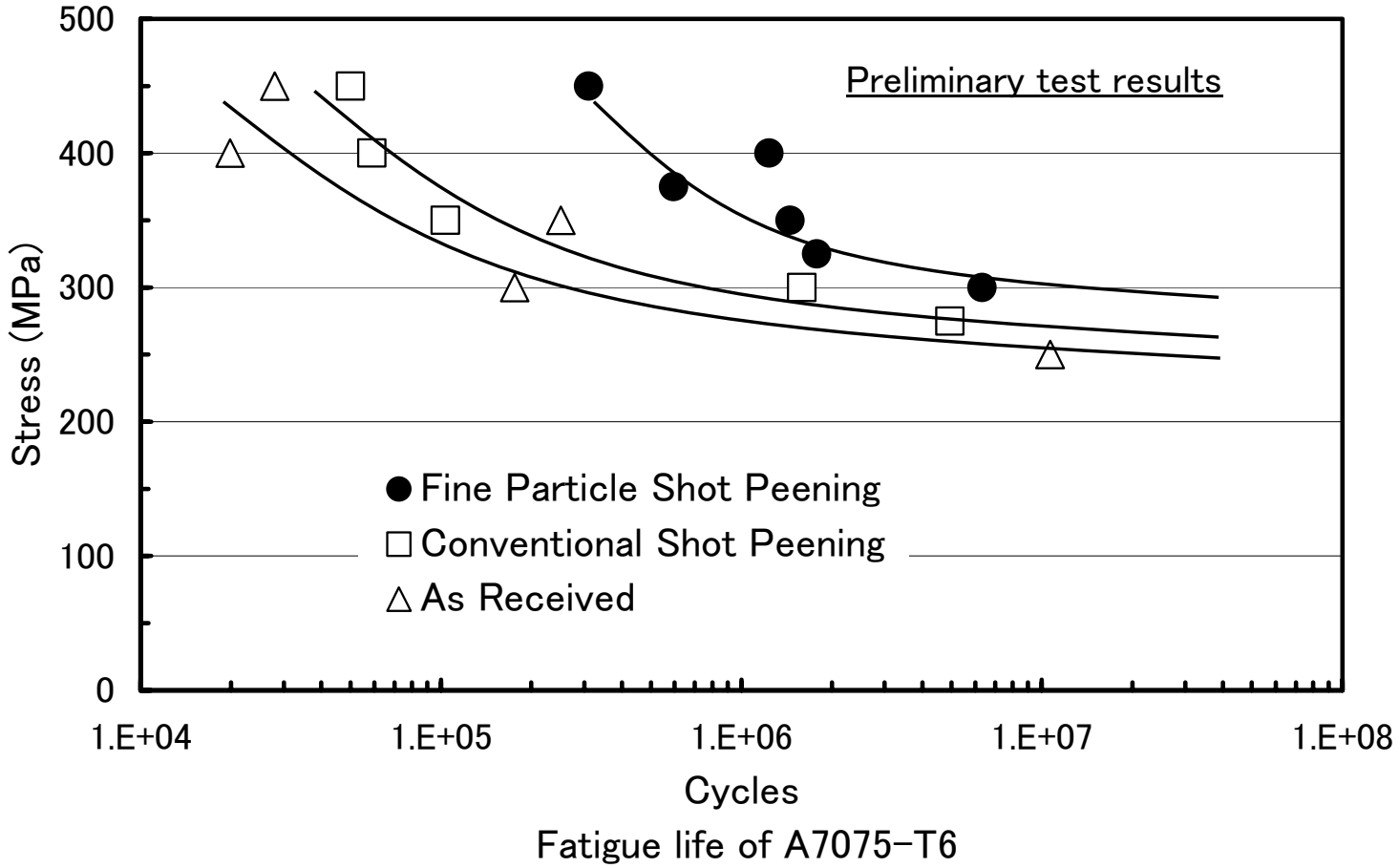
3. Basic fatigue properties of A7075-T6 by FPSP

3.1. Preliminary S/N data (φ6mm, tension-tension, R=0.1)



Fatigue life of A7075-T6

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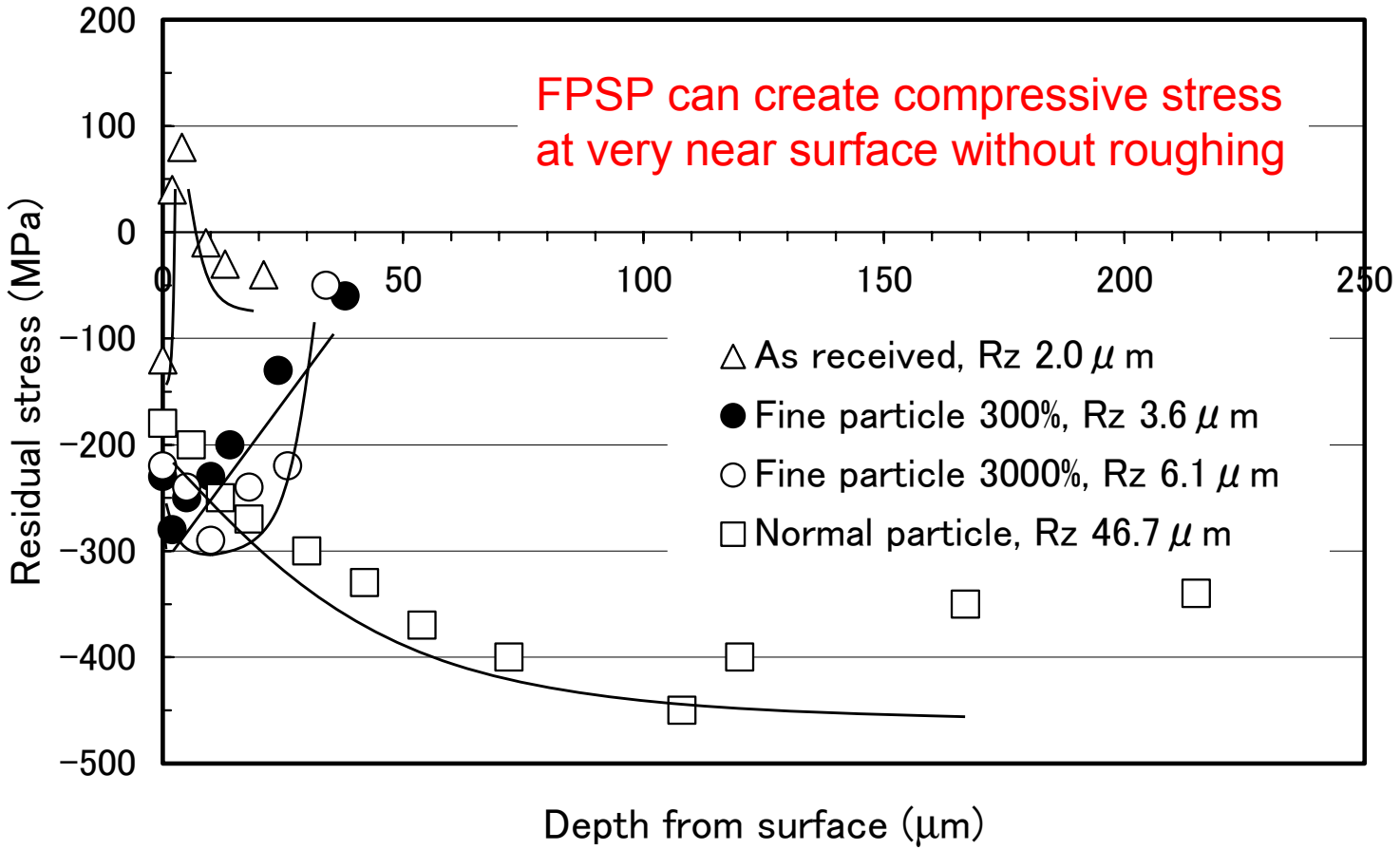
3. Basic fatigue properties of A7075-T6 by FPSP

3.2. Residual stress measurement by XRD



Residual stress by fine particle shot peening

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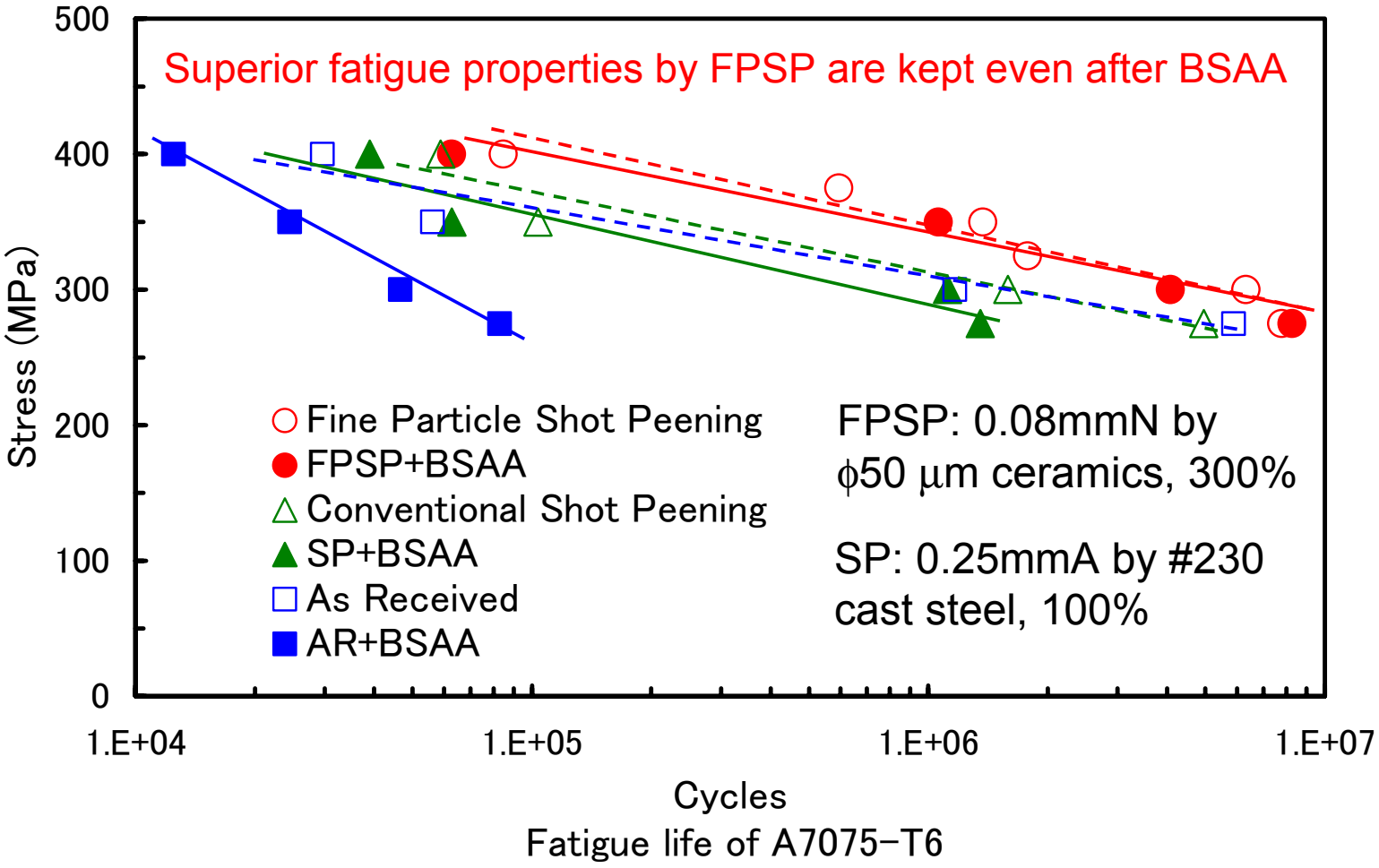
4. Fatigue properties of FPSP A7075 followed by BSAA

4.1. S/N data (φ6mm, tension-tension, R=0.1)



Fatigue life of A7075-T6

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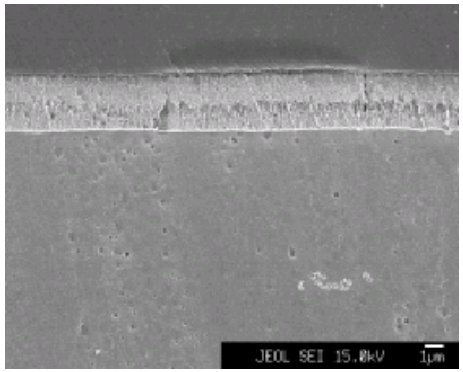
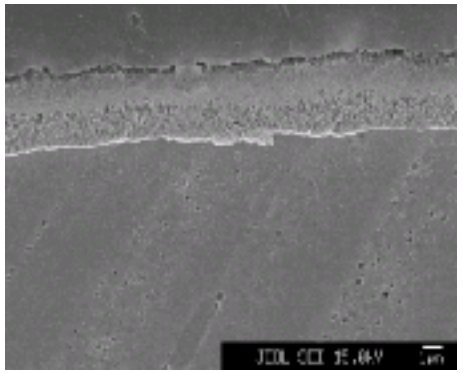
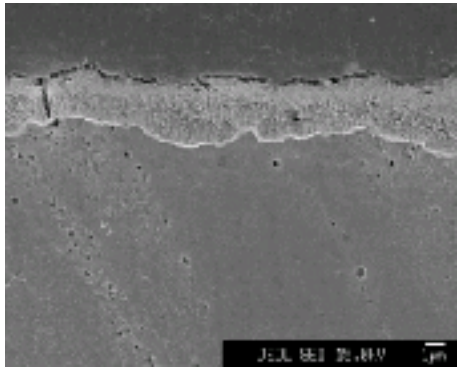
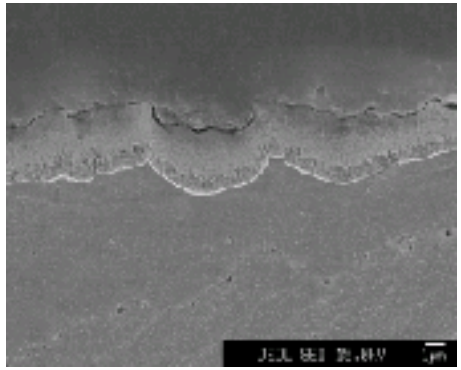
4. Fatigue properties of FPSP A7075 followed by BSAA

4.2. SEM photographs of specimen cross section after BSAA

As received (Machined)	SP Conventional shot peened
 2μm	 2μm
FPSP Fine particle shot peened	**SP+FPSP**
 2μm	 2μm

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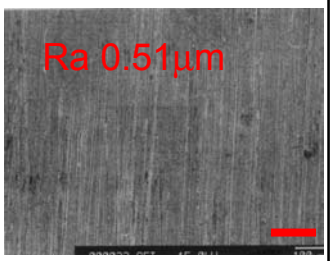
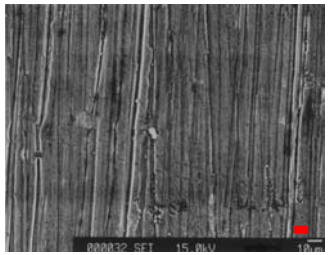
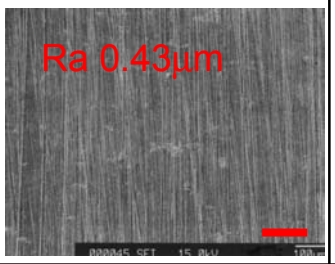
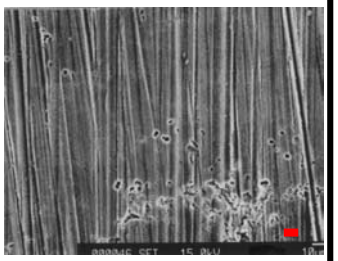
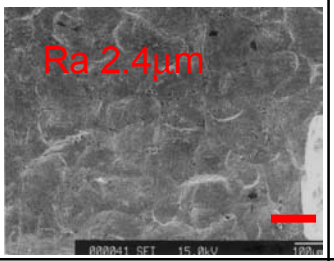
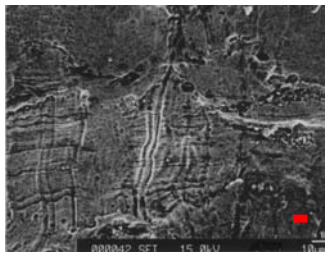
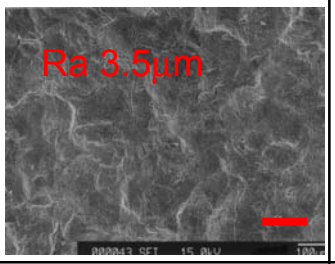
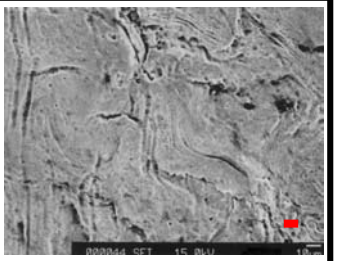
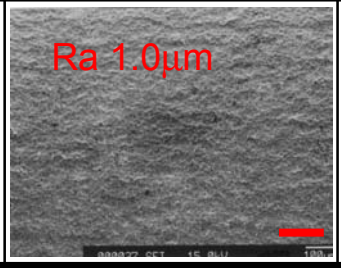
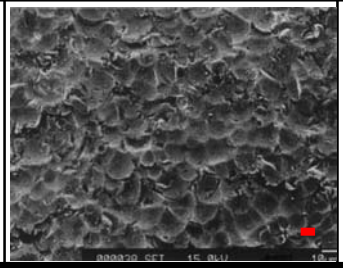
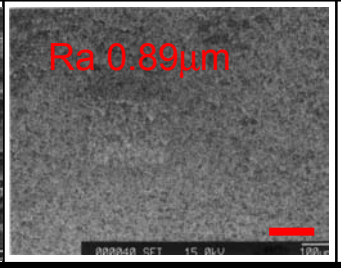
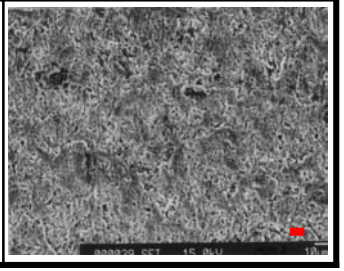
4. Fatigue properties of FPSP A7075 followed by BSAA

4.3. SEM photographs of specimen surfaces, No.1

	Before BSAA		After BSAA	
	— 100μm	- 10μm	— 100μm	- 10μm
As received (Machined)				
SP Conventional shot peened				
FPSP Fine particle shot peened				

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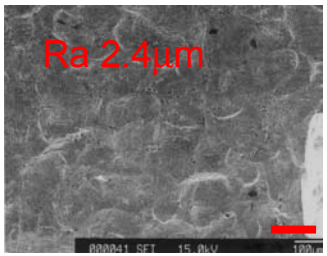
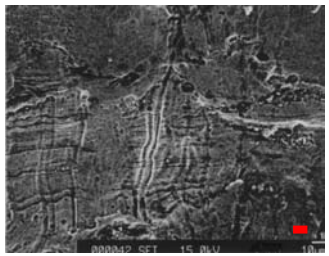
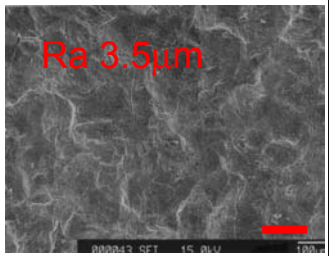
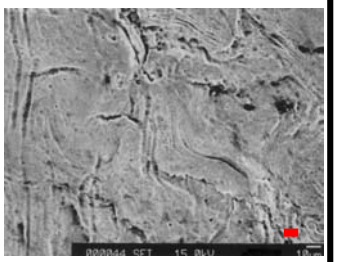
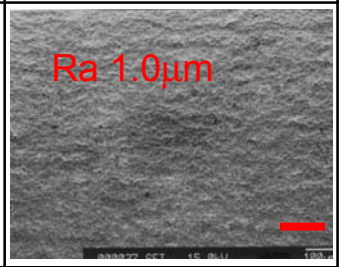
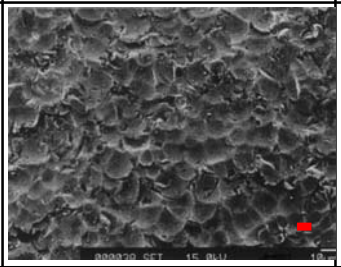
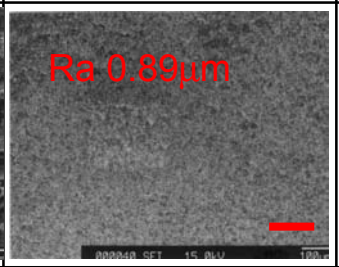
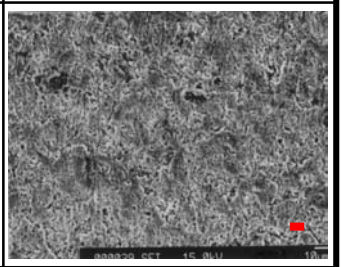
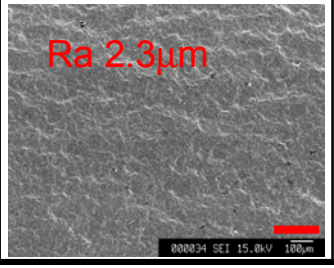
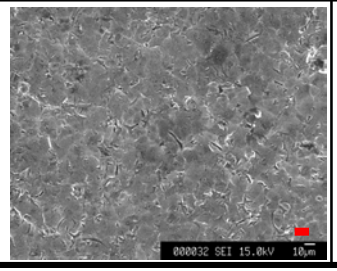
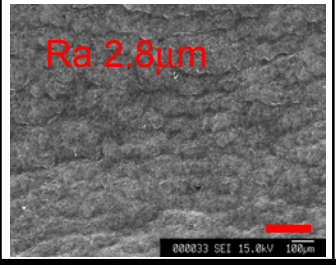
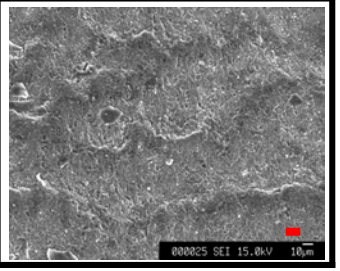
4. Fatigue properties of FPSP A7075 followed by BSAA

4.4. SEM photographs of specimen surfaces, No.2

	Before BSAA		After BSAA	
	— 100μm	- 10μm	— 100μm	- 10μm
SP Conventional shot peened				
FPSP Fine particle shot peened				
SP+FPSP				

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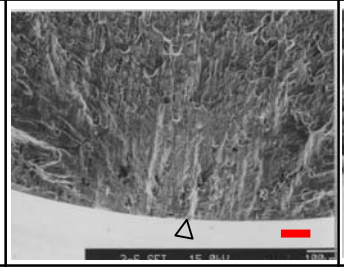
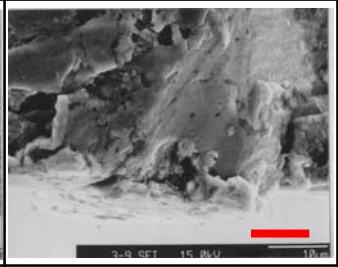
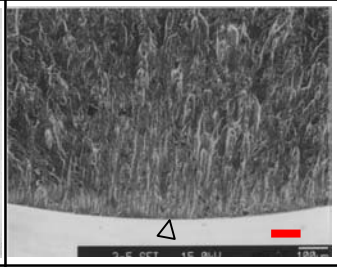
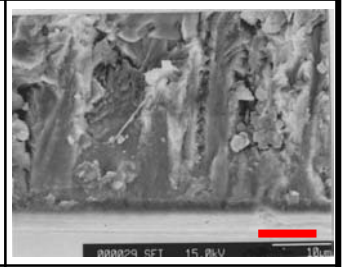
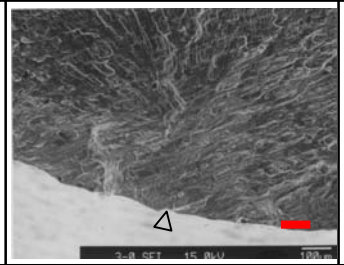
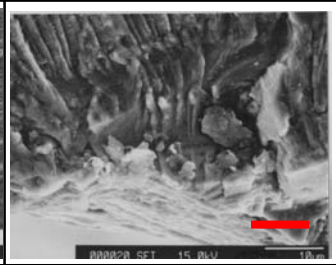
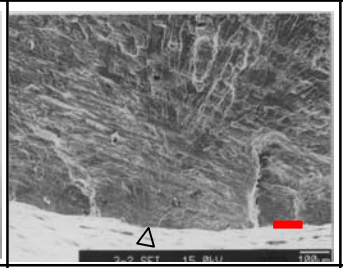
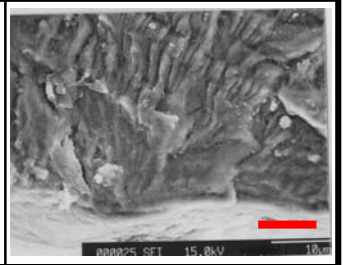
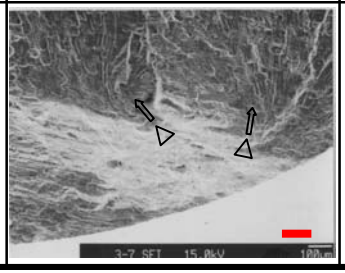
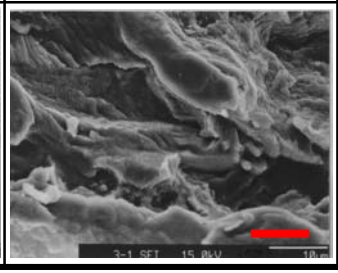
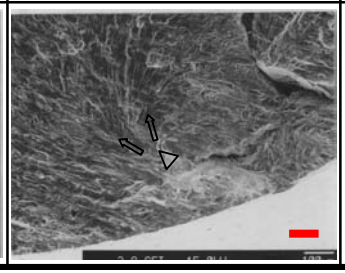
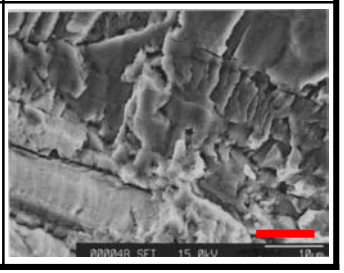
4. Fatigue properties of FPSP A7075 followed by BSAA

4.5. SEM photographs of fracture surfaces, No.1

	Before BSAA		After BSAA	
	100μm	10μm	100μm	10μm
As received (Machined)				
SP Conventional shot peened				
FPSP Fine particle shot peened				

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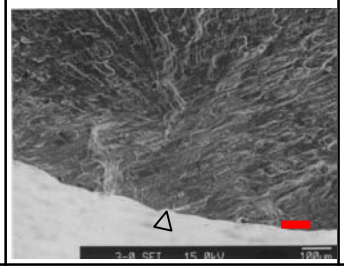
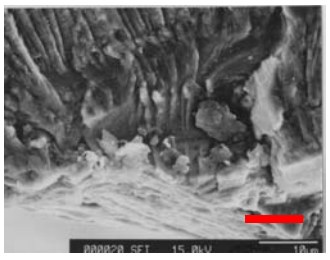
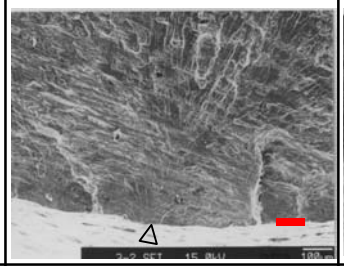
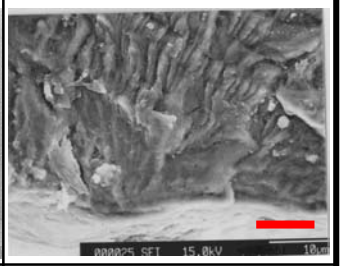
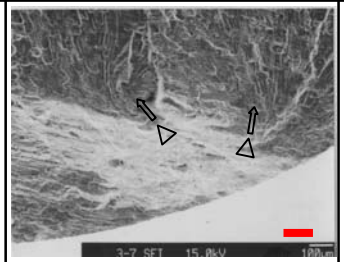
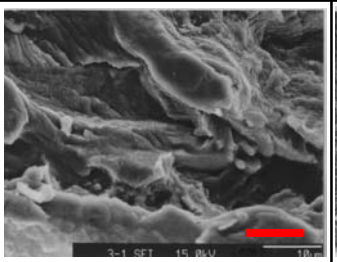
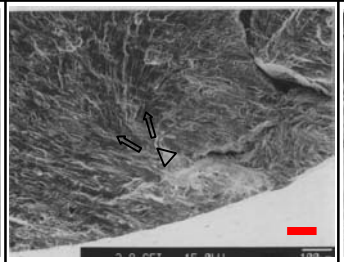
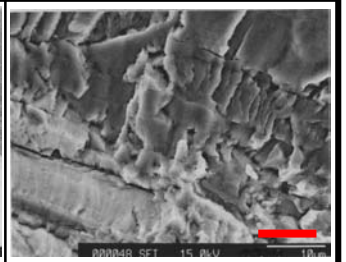
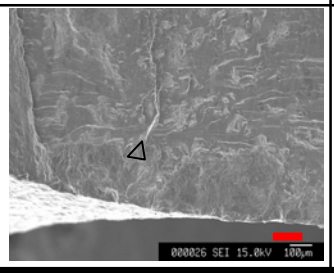
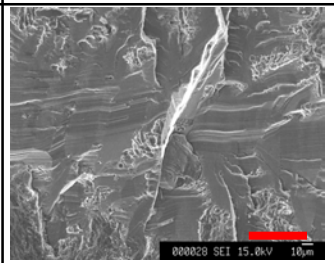
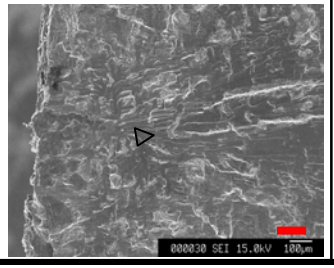
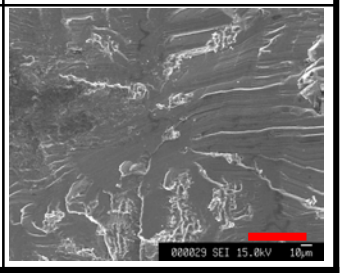
4. Fatigue properties of FPSP A7075 followed by BSAA

4.6. SEM photographs of fracture surfaces, No.2

	Before BSAA		After BSAA	
	100μm	10μm	100μm	10μm
SP Conventional shot peened				
FPSP Fine particle shot peened				
SP+FPSP				

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5. Summary

- **Fine Particle Shot Peening (FPSP) creates superior fatigue properties compared with conventional Shot Peening due to high compressive stress at very near surface with very limited surface damage.**

- **Superior fatigue properties by FPSP remain even after anodize process.**

- **SEM observations show**
  - **surface of FPSP specimens are smooth after BSAA.**
  - **origin of fracture of FPSP specimens are inside regardless of BSAA.**

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