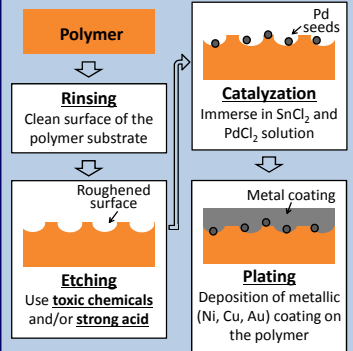
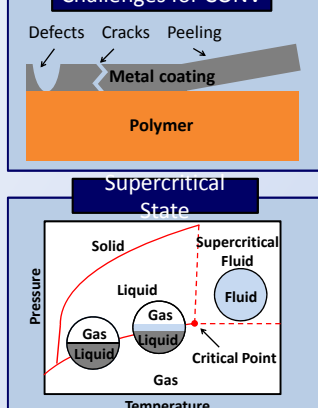


Background

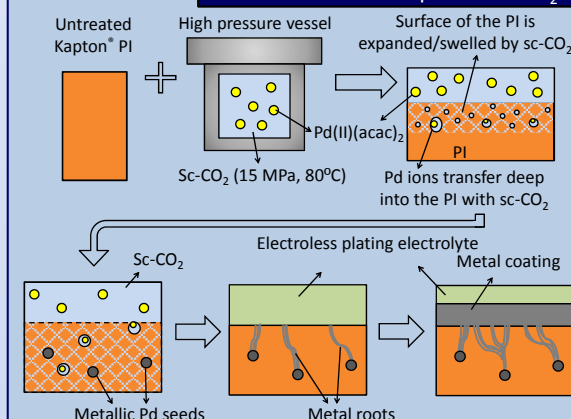
Conventional Metallization (CONV)



Challenges for CONV



Metallization with Supercritical CO_2



Advantages

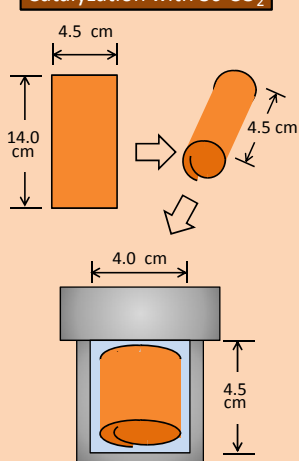
- Exclude the etching step
- High surface uniformity
- High adhesion strength

Shortcomings

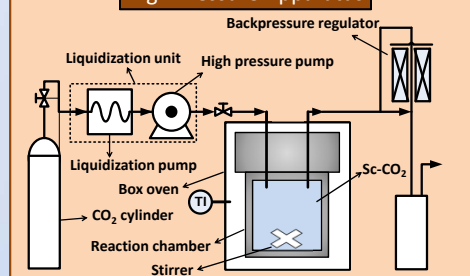
- Size of the substrates is limited by size of the high pressure vessel
- Typically 1 cm × 2 cm

Experimental Section

Catalyzation with Sc-CO_2



High Pressure Apparatus



Catalyzation Conditions

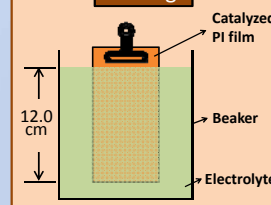
Materials

- ✓ 99.99% CO_2
- ✓ $\text{Pd(II) acetylacetonate}$, Pd(II)(acac)_2
- ✓ Kapton® PI film

Conditions

- ✓ Pressure: 15 MPa
- ✓ Temperature: 80 °C
- ✓ Time: 60 min

Plating



Plating Conditions

Electrolyte

- ✓ NICHEM PF 500 provided by Atotech Taiwan Ltd.
- ✓ 5.5 g/L Ni^{2+}
- ✓ pH = 4.7

Conditions

- ✓ Temperature: 70 °C
- ✓ Time: 3, 5, 6, 8 min

Characterization

Morphology & Thickness

- ✓ FeSEM

Resistivity

- ✓ Four Point Probes

Adhesion

- ✓ PosiTest® Pull-Off Adhesion Tester

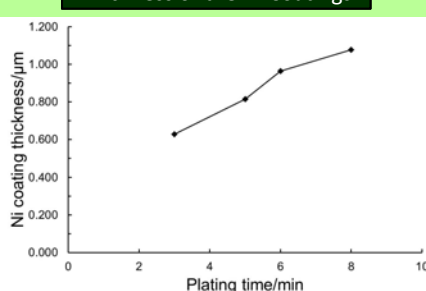


Results and Discussion

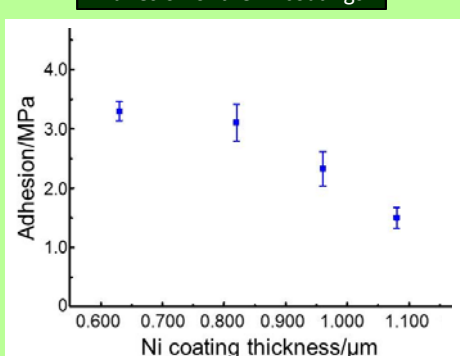
Appearance of the Film



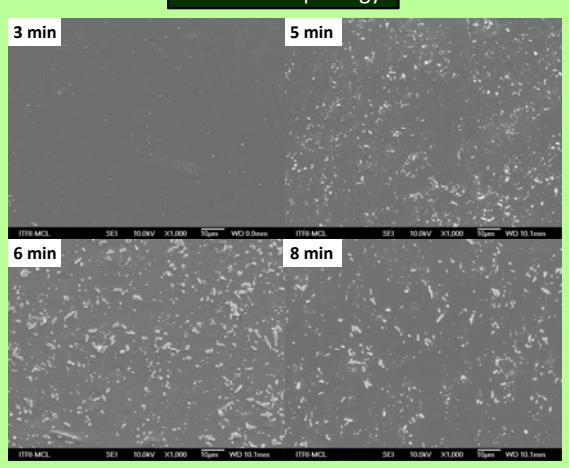
Thickness of the Ni Coatings



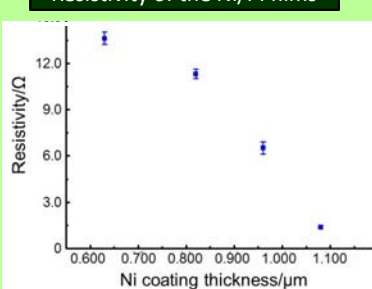
Adhesion of the Ni coatings



Surface Morphology



Resistivity of the Ni/Pi films



Conclusions

- Metallization of 4.5 cm × 12 cm Kapton® PI films was realized.
- Adhesion of the Ni coating was 3.3 MPa when the thickness was 0.628 μm.

Reference

1. Y. Shacham-Diamand et al., Microelectron. Eng. 132 (2015) 35-45.
2. B.H. Woo et al., Microelectron. Eng. 86 (2009) 1179-1182.
3. B.H. Woo et al., Surf. Coat. Technol. 209 (2009) 1971-1978.