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## APPENDICES

### Appendix A Operating Procedure for the Glove Box

#### A.1 General

There are several things that a user should have to avoid when using the glove-box:

(1) Bringing water or air into the box. All flasks brought in must be nitrogen-filled or evacuated. Make sure all empty containers are open when the airlock is being pumped down. Remember to open packets containing syringes etc. before bringing them in.

(2) Sucking the gloves into the box. If you leave the airlock's inner door open and evacuate the airlock, you evacuate the inside of the box. The gloves will suck in, balloon up and then burst.

(3) Having both the inner and outer door to the airlock open at the same time.

(4) Putting holes in the gloves.

(5) Putting some inhibitor agents such as thiols, amines, phosphines, halides etc. into the glove-box. They can damage the catalysts. If you need to use these materials, you must first shut down the fan of catalyst box. Afterwards, you will need to purge the box atmosphere before re-opening the fan.

#### A.2 Airlock Operation

A.2.1 Bringing something into the glove-box (beginning from vacuum condition):

(1) Close the airlock valve leading to the vacuum pump.

(2) Slowly open the airlock nitrogen valve until the airlock is at atmosphere pressure then close the valve.

(3) Double check that the inner door is not open.

(4) Open the outer door, place your stuffs inside and close the outer door.

(5) Double check that the nitrogen valve is closed, then slowly open the airlock vacuum valve.

(6) After 10 minutes of pumping ( $\sim 25$  in  $H_2O$ ), close the airlock pump valve and partially backfill the airlock with nitrogen. Then evacuate the airlock again.

(7) Repeat the above process after an additional 5 minute interval with 3 times for nitrogen and 2 times for nitrogen/hydrogen mix-gas

(8) After another last 5 minutes, close the airlock pump valve, then backfill the airlock to atmospheric pressure with the mix-gas.

(9) Open the inner door and bring in your stuffs.

#### A.2.2 Bringing something out of the glove-box:

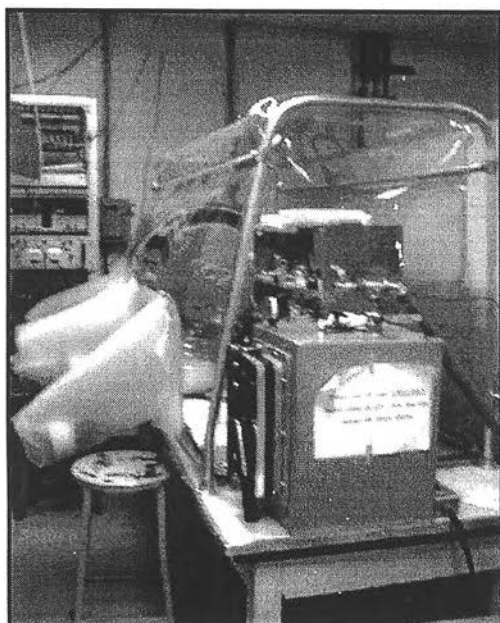
(1) Follow the above instructions to get the airlock under nitrogen.

(2) Put your stuffs in the airlock and close the inner door.

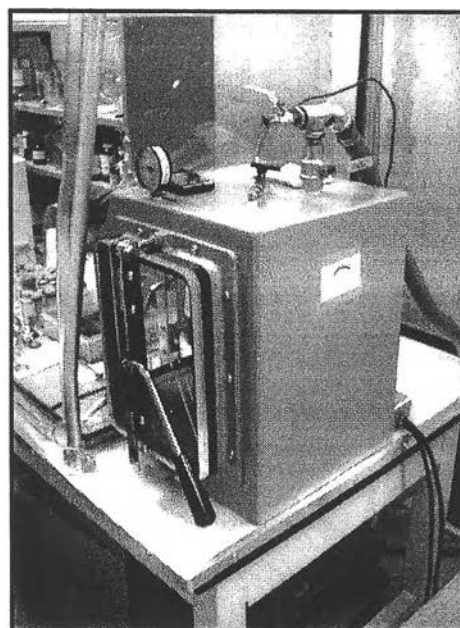
(3) Double check that the inner door is closed and that both airlock valves are closed.

(4) Open the outer door, remove your stuffs and close the outer door.

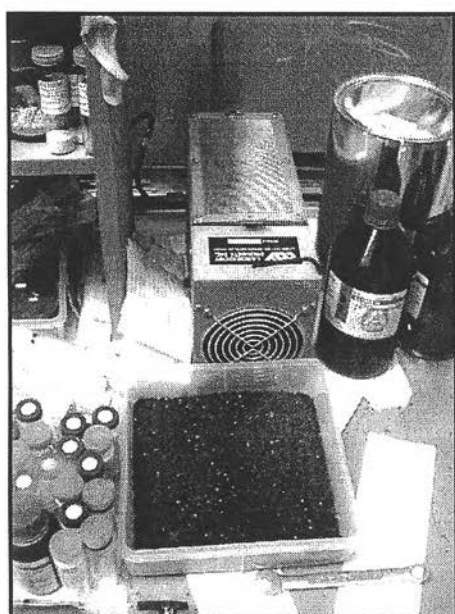
(5) Double check that the nitrogen valve is closed, then slowly open the airlock vacuum valve.



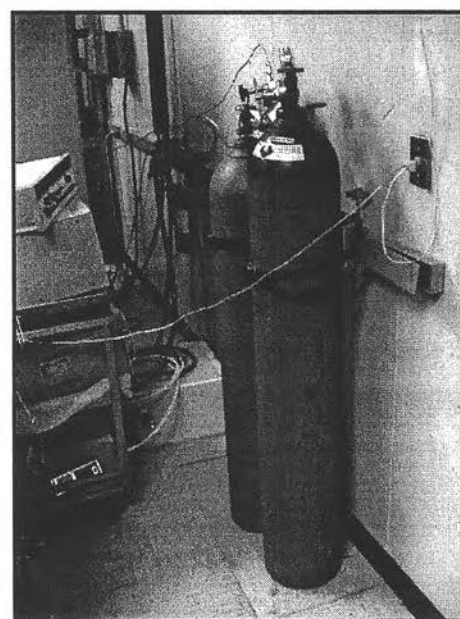
(A)



(B)



(C)



(D)

**Figure A.1** The glove box; (A) The glove box system, (B) The air lock, (C) The catalyst box and silica gel, and (D) Supplied gases for the glove box ( $N_2$  and 10 %  $H_2/N_2$ ).



**Figure A.2** Catalyst rejuvenation by drying at 150 °C.

## Appendix B Additional Supplement for Reading

[1]. More reviews in metallocene catalyst see in: [1a] G. G. Hlatky "Metallocene catalysts for olefin polymerization Annual Review for 1996" *Coordination Chemistry Reviews*, 1999, 181, 243-296. [1b] G. G. Hlatky "Single-site catalysts for olefin polymerization: Annual Review for 1997" *Coordination Chemistry Reviews*, 2000, 199, 235-329. [1c] Y. Imanishi, N. Naga "Recent Developments in Olefin Polymerizations with Transition Metal Catalysts" *Prog. Polym. Sci.*, 2001, 26, 1147-1198. [1d] H. G. Alt, E. Samuel "Fluorenyl Complexes of Zirconium and Hafnium as Catalysts for Olefin Polymerization" *Chem. Soc. Rev.*, 1998, 27, 323-329. [1e] J. Scheirs, W. Kaminsky "Metallocene-Based Polyolefins" *Wiley Series in Polymer Science*, Vol. 1, 1999. [1f] R. Blom, A. Follestad, E. Rytter, M. Tilset, M. Ystenes "Organometallic Catalysts and Olefin Polymerization" Springer, Berlin, 2001. [1g] W. Kaminsky "Highly Active Metallocene Catalyst for Olefin Polymerization" *J. Chem. Soc., Dalton Trans.*, 1998, 1413-1418. [1h] G. Fink, R. Mülhaupt, H. H. Brintzinger "Ziegler Catalysts" 1995, Springer-Verlag, Germany. [1i] T. Sano, T. Uozumi, H. Nakatani, M. Terano "Progress and Development of Catalytic Olefin Polymerization" 2000, Technology and Education Publishers, Tokyo. [1j] H. H. Brintzinger, D. Fischer, R. Mülhaupt, B. Rieger, R. M. Waymouth "Stereospecific Olefin Polymerization with Chiral Metallocene Catalysts" *Angew. Chem. Int. Ed. Engl.*, 1995, 34, 1143-1170.

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