

# HOW TO TEST BOTTLE CO<sub>2</sub> TRANSMISSION RATE FOR SHELF-LIFE ESTIMATION

Use MOCON® PERMATRAN-C® 4/30 to test package or bottle carbon dioxide transmission rate

## Background

The MOCON PERMATRAN-C 4/30 is the next generation CO<sub>2</sub>TR test system for barrier films and packages. It is ideal for empty bottle and prefilled carbonated soft drink (CSD) bottle testing with excellent correlation to Zahm & Nagel shelf-life studies but requiring much less time. The following paragraphs will demonstrate the process to estimate carbonated product shelf-life using a fast and accurate method.

## Parameters

There are two ways to test the bottle samples with PERMATRAN-C 4/30: An empty bottle, or the CO<sub>2</sub>-prefilled bottle.

## Testing CO<sub>2</sub>TR of the Empty Bottle

Testing the empty bottle is the same as testing other packages with a MOCON® permeation analyzer.

- Seal the opening of the bottle onto the mounting foil by epoxy, set overnight for curing.
- Install the assembled sample onto the Test Chamber Cartridge.
- Use the [PackRack® Package Testing Fixture](#) to connect the assembled sample/cartridge to the PERMATRAN-C 4/30 via copper tubing.
- Please note: Advanced Test should be selected for any package CO<sub>2</sub>TR testing when setting up the test parameters in the software. One may either choose to run in Auto test or Advanced test. For system leak baseline check, the test should be performed either by a copper loop or test the cartridge without the sample but use a blank foil.

See Fig. 1 for an example of testing an empty bottle.

Testing empty bottles or containers is useful for evaluating the barrier properties; especially during the packaging R&D design stage and QA/QC process.



# METHODS TO TEST EMPTY OR PREFILLED PACKAGE SAMPLES

## Testing CO<sub>2</sub>TR of the Prefilled Carbonated Drink Bottle for Product Shelf-Life Estimation

A MOCON Capture Vessel Cartridge is needed for testing prefilled carbonated drink bottle (Fig 2).

- Prefill the bottle with carbonated water to manufacturer's specifications
- Use the appropriate package Capture Vessel Cartridge size. Four sizes are available
- Place the prefilled package inside the capture vessel and close the seal
- Connect the sealed cartridge to the carrier gas lines of PERMATRAN-C 4/30 via PackRack
- No separate test gas supply is needed
- Please note: Advanced Test should be selected for any package CO<sub>2</sub>TR testing
- For system leak baseline check, the test should be performed with an empty Capture Vessel Cartridge

For users interested in testing a carbonated drink bottle's CO<sub>2</sub>TR along with its estimated shelf life, special technical training is provided upon request. This training comes with a specially designed spreadsheet to estimate the shelf life of a given pressurized carbonated drink bottle (Fig 3).

To obtain the estimated shelf life of the carbonated drink bottle, the following parameters should be entered into the spreadsheet:

- Bottle Initial Gas Volume (GVI): This should be the gas volume at the time of testing
- Bottle Gas Volume Expired (GVE): This is the gas volume at the end of shelf life
- Initial Volume of the bottle (in the unit of cc)
- Bottle CO<sub>2</sub>TR (in the unit of cc/day): This is the CO<sub>2</sub>TR obtained from PERMATRAN-C 4/30

## Conclusion

The MOCON PERMATRAN-C 4/30 can not only test film and package samples, but its CO<sub>2</sub>TR test result from prefilled carbonated drink bottle can be used to estimate shelf life of the product. If you are interested in estimating your carbonated drink's shelf life from tested CO<sub>2</sub>TR data, please contact your account manager for a special training along with the specially designed spreadsheet.

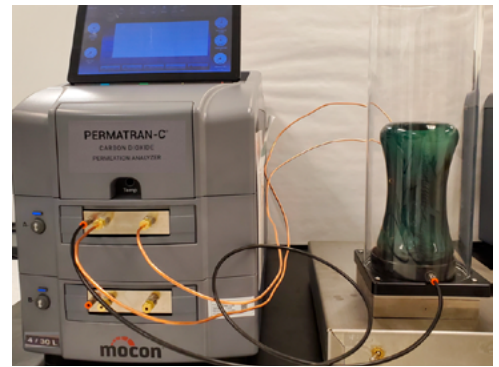


Fig 1. Empty Bottle CO<sub>2</sub>TR Testing



Fig 2. CO<sub>2</sub> Prefilled Bottle CO<sub>2</sub>TR Testing

Parameter	Value	Unit	Notes
Initial Volume of Bottle (cc)	330	cc	
Initial Gas Volume (GVI) (cc)	100	cc	
CO <sub>2</sub> TR (cc/day)	0.5	cc/day	
Estimated Shelf Life (days)	100	days	
Final Gas Volume (GVE) (cc)	100	cc	

Calculated Values	Value	Unit	Notes
Final Volume (cc)	230	cc	
Gas Volume Expired (GVE) (cc)	100	cc	
Estimated Shelf Life (days)	100	days	
CO <sub>2</sub> TR (cc/day)	0.5	cc/day	

Fig 3. Example of Shelf Life Calculation Spreadsheet