

# **Attachment 4**

**Abbreviated or Condensed View Graphs of Two Papers on  
Stochastic Analysis and Modeling, One Recently Published and  
the Other Presented at the Annual Meeting of AIChE, San  
Francisco, CA, November 16 – 21, 2003**

# Stochastic Modeling of Thermal Death Kinetics of a Cell Population: Revisited

by Fan, Argoti-Caicedo, Chou, and Chen  
(*Chemical Engineering Education*, 37, 228-235)

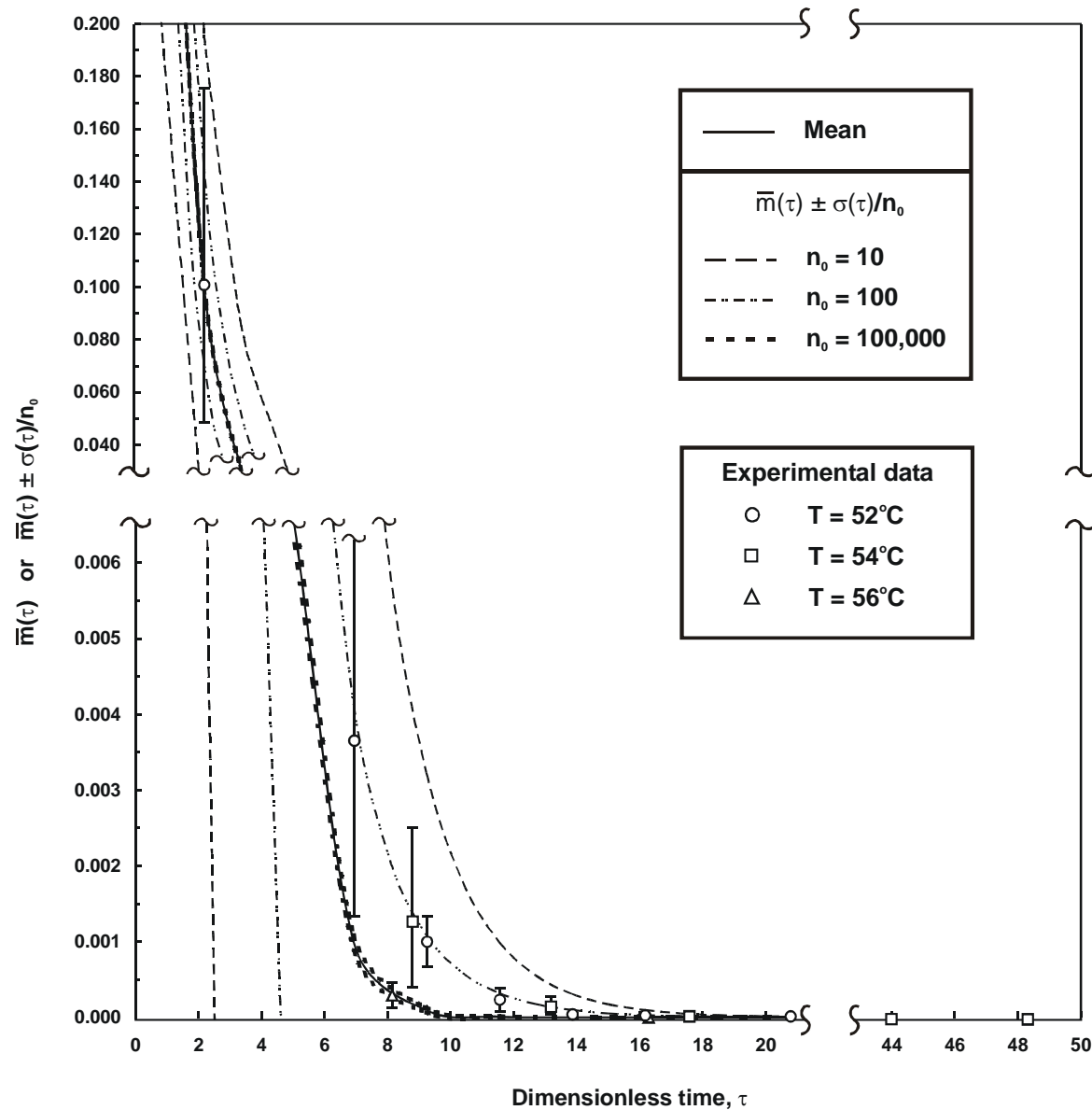
- Microorganisms: Discrete and randomly behaving
- Stochastic modeling: Pure-death process

$$\frac{d}{dt} p_n(t) = \mu_{n+1} p_{n+1}(t) - \mu_n p_n(t)$$

- **Mean** and higher moments:  
**Variance**, **skewness**, and **kurtosis**.
- Comparison with experimental data: Mean in accord with experimentally measured data



Electron microscopic image of *S. aureus* (From: <http://www2.uol.com.br/cienciahoje/chdia/n468.htm>)



**Normalized mean,  $\bar{m}$ , and normalized standard deviation,  $\bar{\sigma}$ , as functions of the dimensionless time,  $\tau$ , for the low-range of the number concentration of live cells**

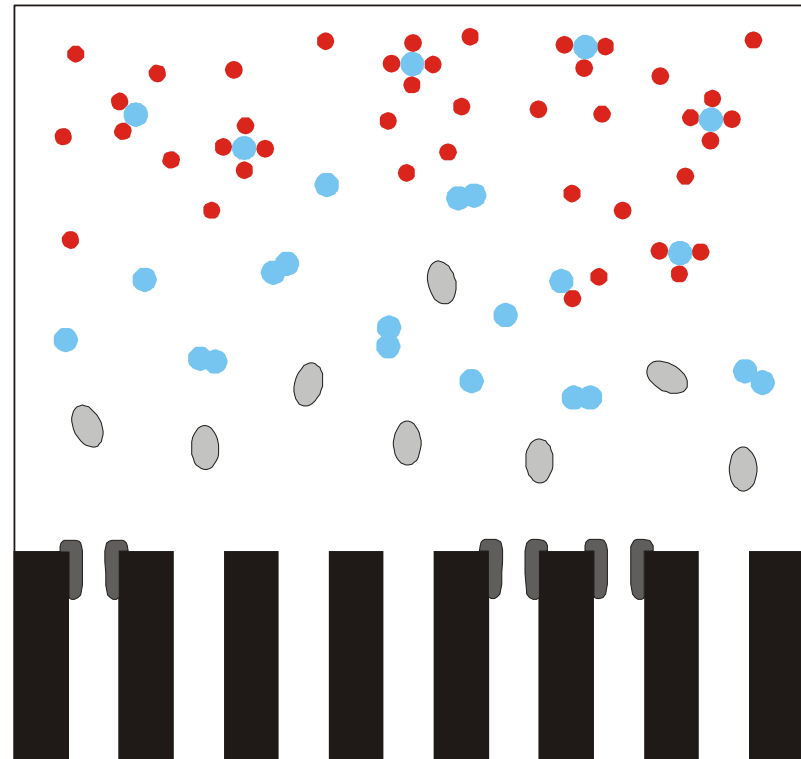
# Stochastic Modeling and Simulation of the Formation of Carbon Molecular Sieves by Carbon Deposition

by Fan, Argoti, Walawender, and Chou

- CMS Formation: Complex and random
- Stochastic modeling: Pure-birth process

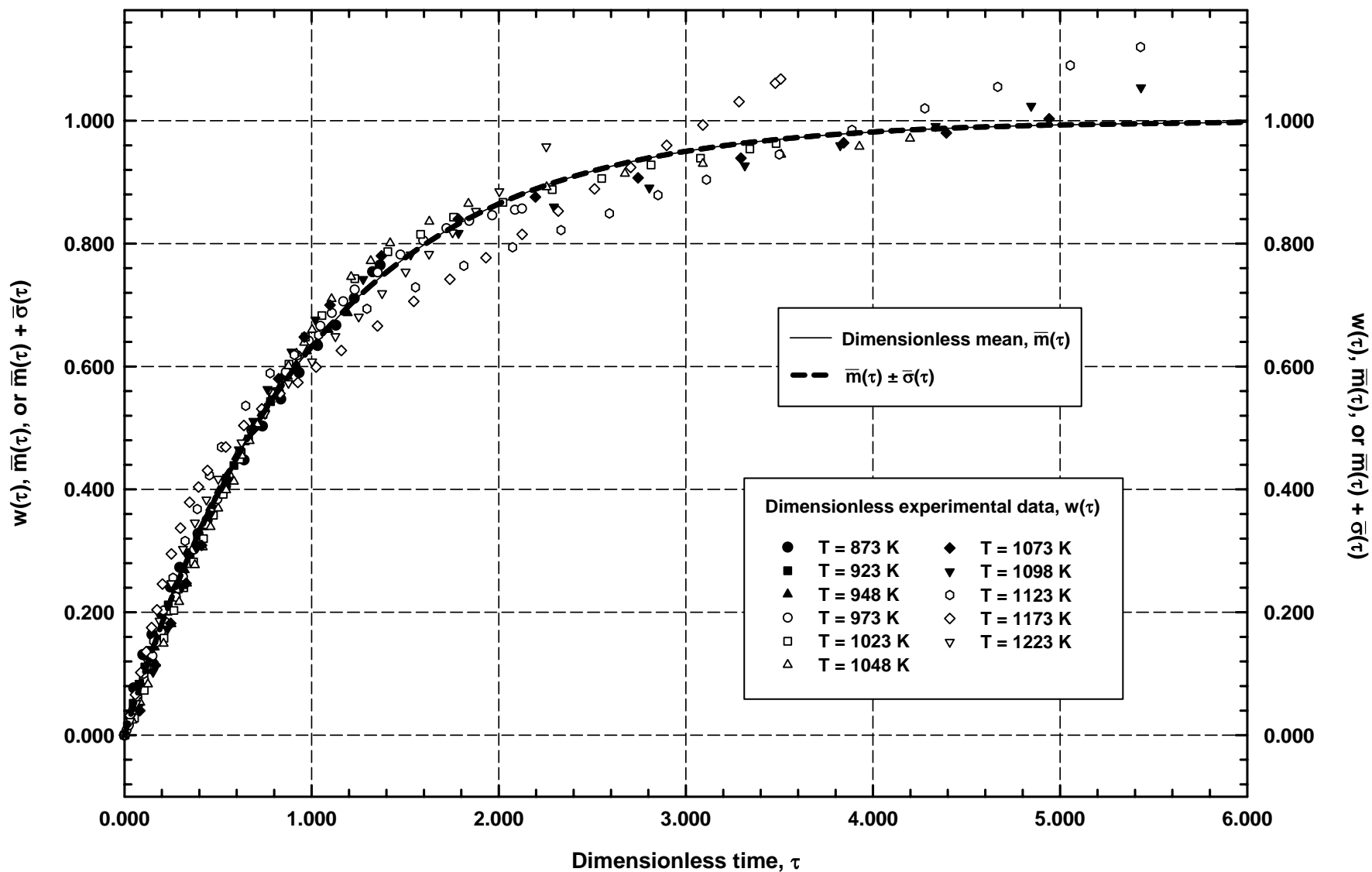
$$\frac{d}{dt} p_n(t) = \lambda_{n-1} p_{n-1}(t) - \lambda_n p_n(t)$$

- Mean and higher moments: Variance, skewness, kurtosis, etc
- Comparison with experimental data: Mean in accord with experimentally measured data



**Side view of the progression of CMS formation:**

**Carbon source**  ; **Fine carbon particle**  ; **Carbon packet** 



**Dimensionless mean,  $m$ , and dimensionless standard deviation,  $\bar{\sigma}$ , for the pore-narrowing as functions of the dimensionless time,  $\tau$**