



M.Tech. and Dual Degree Project Presentations

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These are my personal views as a member of the PG committee.



Ingredients of a Successful Project

- Read, read and read!
 - You cannot be successful without reading
 - **Most important** and most neglected aspect of research!
- Ask yourself: “why would someone care?”
 - Understand the “**big picture**”
- Think! This is not your advisor’s thesis
 - Don’t do something because “guide told me”
- Critically analyze (and cite) ideas/data from others
 - Science relies on **observations** not reputations



Good Research Ideas

- **Simplicity**; Novelty.
 - Complicated and confounding \neq good research
 - Avoid jargon, but use technical language
- Fundamentally sound ideas
 - Relate to previous work
 - Data = GIGO¹; Data + "Fundaes" = Information
- Benchmarks and Deliverables
 - **Implementation** is key

¹ Garbage In Garbage Out



Plagiarism

Using someone else's ideas without attribution

The large fractional heat losses are due to the high surface area-to-volume ratio inherent to these microscale systems.

Copying
No Attribution

The high surface area-to-volume ratio result in large heat losses.

No Attribution

Norton et. al., (2005) attributed the large fractional heat losses to the high surface area-to-volume ratio inherent to these microscale systems.

Quotation
(4-word rule)



Avoiding Plagiarism

Use your own words and cite appropriately

According to Norton et. al. (2005), “the large fractional heat losses are due to the high surface area-to-volume ratio inherent to these microscale systems.”

Quote

The high surface area-to-volume ratio result in large heat losses (Norton et. al., 2005).

Proper citation

The surface area-to-volume ratio is large in microreactors.

Common knowledge
in the field

Norton DG, Wetzel ED, Vlachos DG, Ind. Eng. Chem. Res. **45** (2005) 76–84



Communicating Your Research

“Ideas that spread win”

– Seth Godin



Final Project Evaluation

- Project report/paper
 - “Biryani”
 - Most important aspect of your work
 - Detailed, precise and reproducible
- Project Presentations
 - “Menu and description”
 - Key message of your work



Rice is a staple food for Indians, consumed by millions of people. There are many mixed rice varieties to choose from, which are delightful to eat...

MURGH BIRYANI <i>Chicken cooked w/ special Indian rice & flavored spices.</i>	160.00
MUTTON BIRYANI <i>Goat meat cooked w/ special Indian rice & flavored spices.</i>	180.00
SHRIMPS BIRYANI <i>Shrimps cooked w/ special Indian rice & flavored spices.</i>	200.00
MACHHI BIRYANI <i>Boneless fish cooked w/ special Indian rice & flavored spices.</i>	180.00



Successful Communication

- Your work is the focus
- A successful communication is built around a single, central **objective or message**
- Complexity hinders good communication
 - Simple \neq simplistic
 - Its difficult to make things simple
- Prepare well in advance



Equations and Technical Details

Governing equations for the two channels

Continuity:

$$-\frac{\rho}{T_g} \frac{\partial T_g}{\partial t} - \sum_k \left[\frac{\rho \bar{M}}{M_k} \frac{\partial Y_k}{\partial t} \right] + \frac{\partial(\rho u)}{\partial x} = 0$$

Species balance equations

$$\frac{\partial Y_k}{\partial t} + \frac{\rho u}{\rho} \frac{\partial Y_k}{\partial x} = D_{\text{avg}} \frac{\partial^2 Y_k}{\partial x^2} - \hat{a}_g k_{\text{mt},k} (Y_k - Y_{ks})$$

$$0 = \eta M_k \sum_j \nu_{kj} r_{\text{cat},j} + \rho k_{\text{mt},k} (Y_k - Y_{ks})$$

Energy balance equations

$$\rho \bar{c}_p \frac{\partial T_g}{\partial t} + \rho u \bar{c}_p \frac{\partial T_g}{\partial x} = \frac{\partial}{\partial x} \left(k_g \frac{\partial T_g}{\partial x} \right) - \hat{a}_g h_g (T_g - T_s)$$

Governing equation for the wall

$$\begin{aligned} \rho_s c_s \frac{\partial T_s}{\partial t} = & k_s \frac{\partial^2 T_s}{\partial x^2} + \eta \hat{a}_s \sum_j \Delta H_j r_{\text{cat},j}^{\text{exo}} + \eta \hat{a}_s \sum_j \Delta H_j r_{\text{cat},j}^{\text{endo}} \\ & + h_g^{\text{exo}} \hat{a}_s (T_g^{\text{exo}} - T_s) + h_g^{\text{endo}} \hat{a}_s (T_g^{\text{endo}} - T_s) \end{aligned}$$

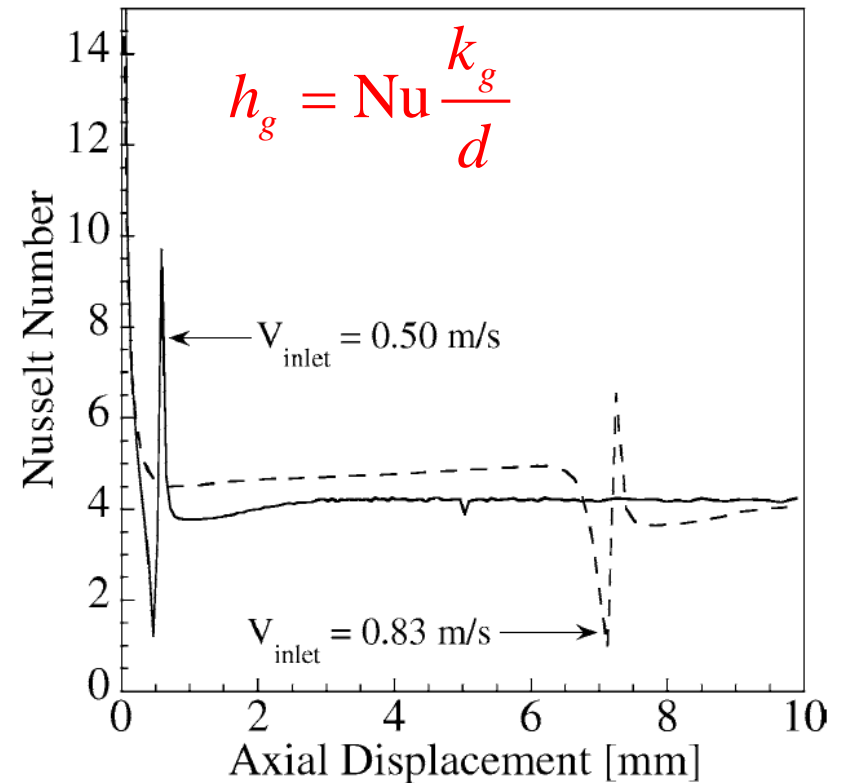
Appropriate for
report / papers
but not for talks



Using Equations in Talks

$$\rho \bar{c}_p \frac{\partial T_g}{\partial t} + \rho u \bar{c}_p \frac{\partial T_g}{\partial x} = \frac{\partial}{\partial x} \left(k_g \frac{\partial T_g}{\partial x} \right) - \underbrace{\hat{a}_g h_g (T_g - T_s)}$$

Don't avoid if essential
Prune the unnecessary
Provide *key features*





Unacceptable Formatting

$$\rho \bar{c}_p \frac{\partial T_g}{\partial t} + \rho u \bar{c}_p \frac{\partial T_g}{\partial x} = \frac{\partial}{\partial x} \left(k_g \frac{\partial T_g}{\partial x} \right) - \hat{a}_g h_g (T_g - T_s)$$

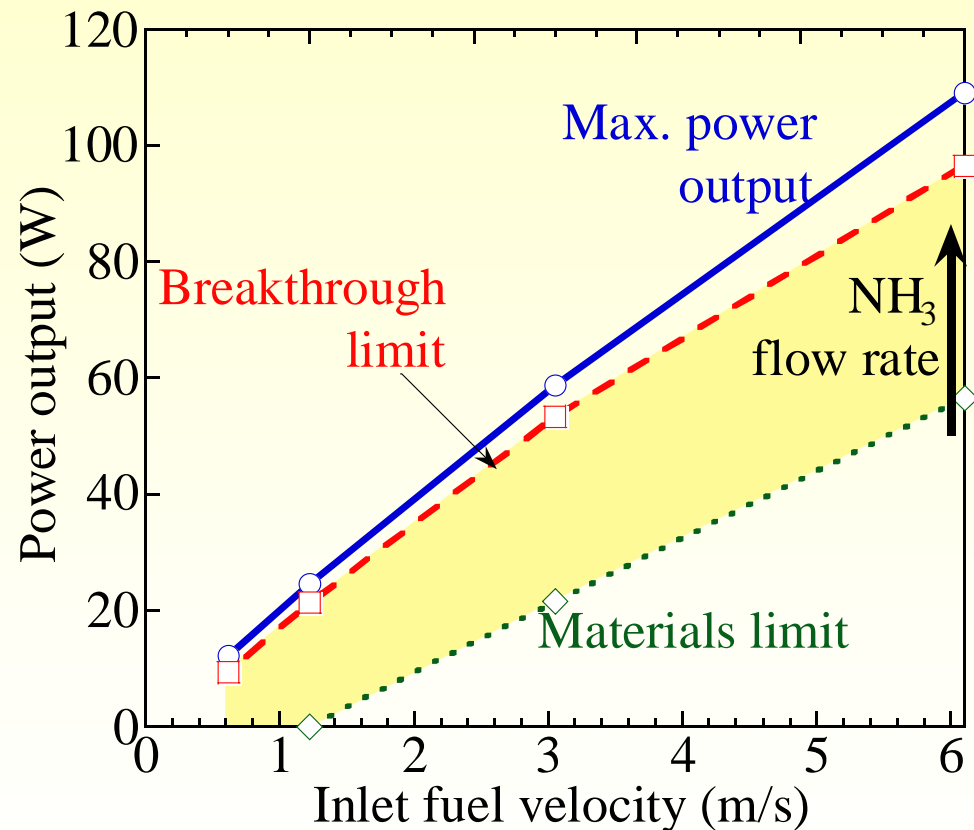
$$\rho c_p dT_g/dt + \rho u c_p dT_g/dx = d/dx (k_g dT_g/dx) - a_g h_g (T_g - T_s)$$



Sentences and Phrases

- Technically precise sentences in report

Power output from a microreactor vs. inlet fuel velocity for wall thermal conductivity of 300 W/m/K. The solid line represents the maximum power output from the device. The shaded region is the operating region for the system. The region beyond the dashed line is undesirable due to incomplete ammonia conversion. The dotted line is the materials stability limit, i.e. $T_{\max} > 1500$ K





Sentences and Phrases

- Technically precise sentences in report

The solid line will be represents
the maximum power outputted
from the device !The shaded
region is the operat region for.
The region beyond the dashed
line is undesirable due to
incomplete ammonia conversion.

Grammar and spellings

Punctuations

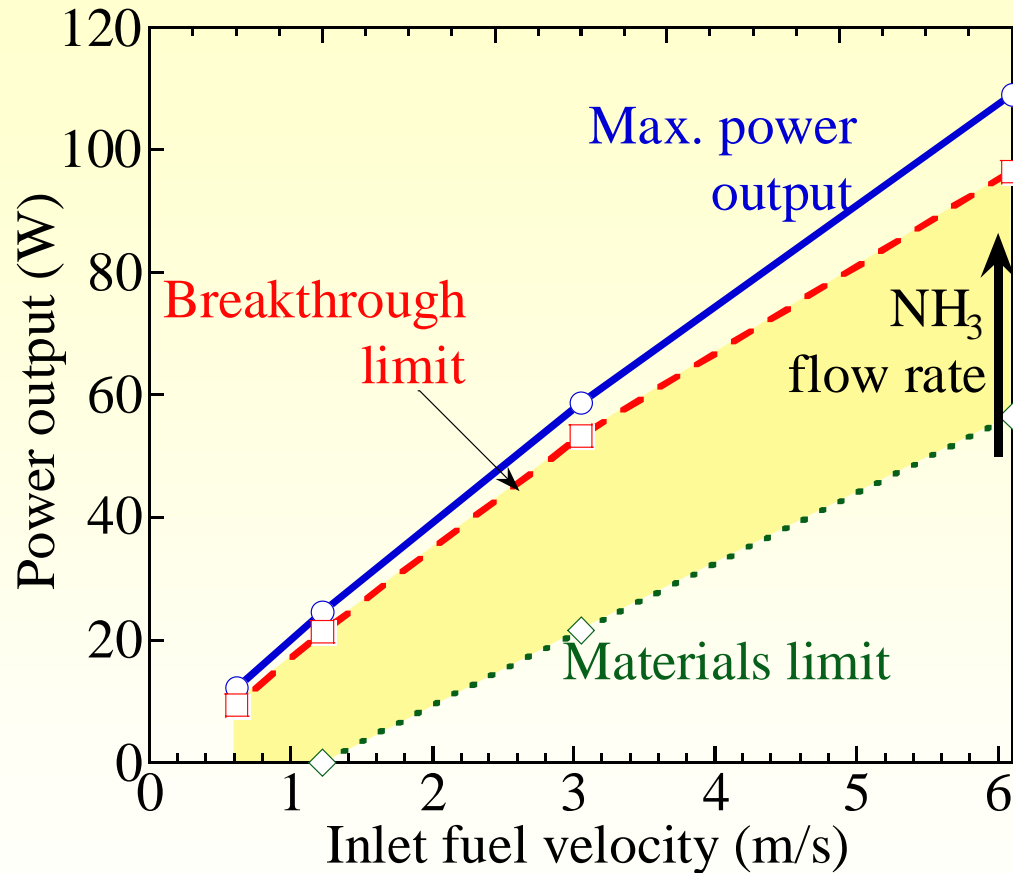
Incomplete sentences

Font



Sentences and Phrases

- Key phrases in presentations



Picture = 1000 words!



Fonts and Colours

- Presentations
 - Minimum font size: 24 (recommended: 28)
 - Use sans-serif fonts (eg., Helvetica, Arial, Tahoma)
 - Use colours to highlight key features



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 - Colours are distracting!



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 - Contrast



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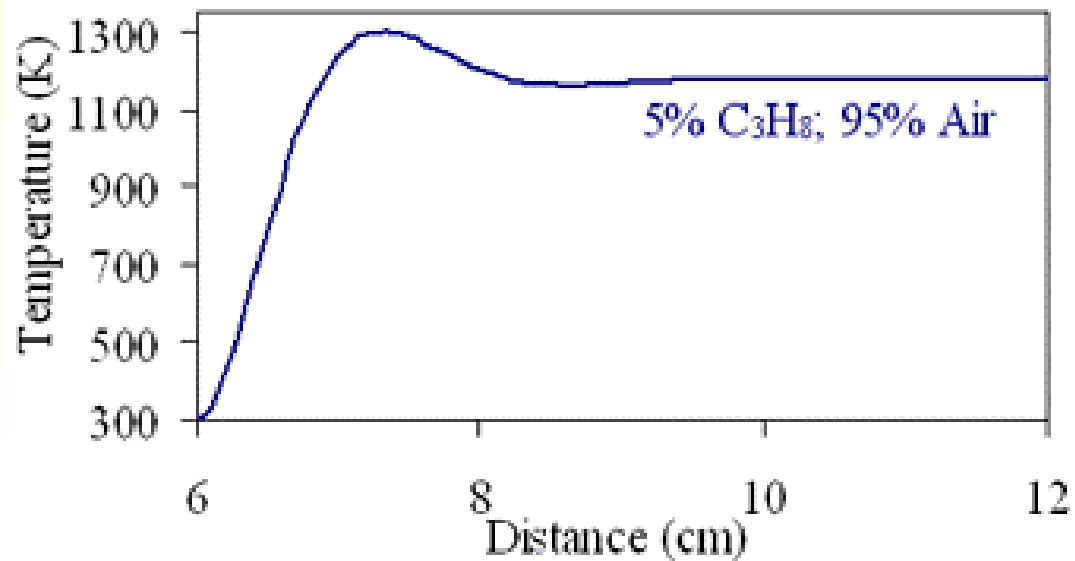
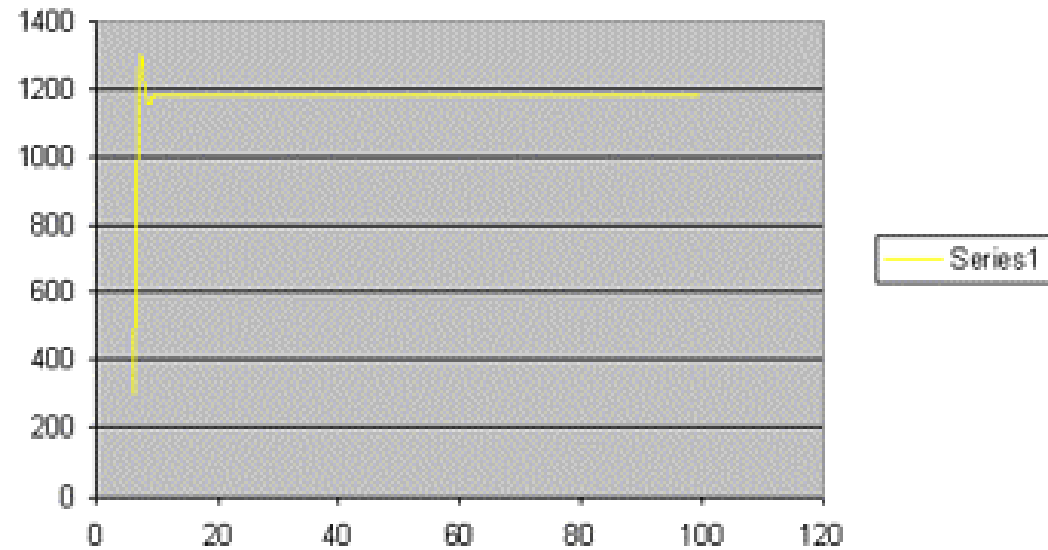
- Papers

- Font size: 12 pt
- Use serif fonts (Times or Computer Modern)
- Black-on-white



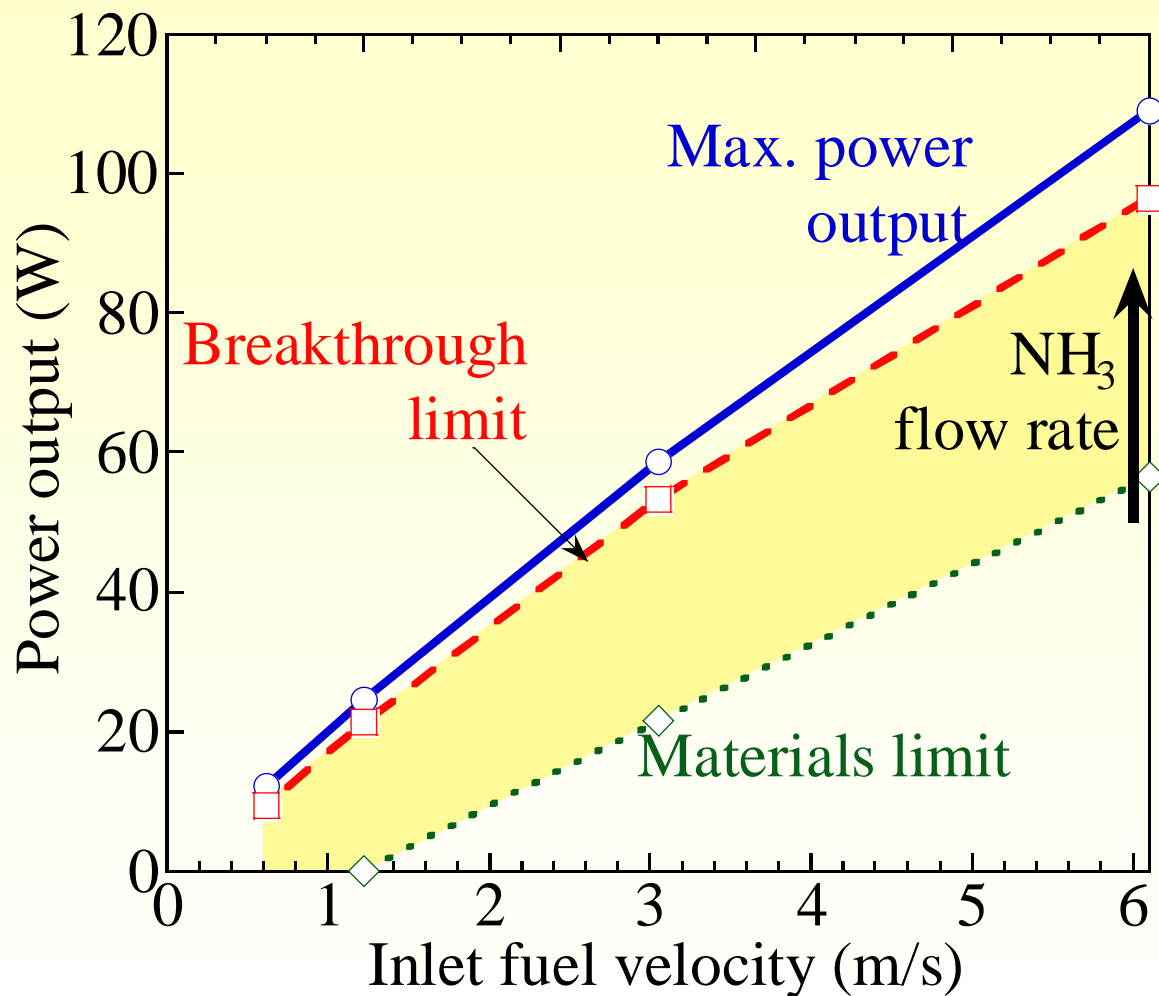
Mind your Figures!

I will give 0
for the entire
M.Tech./DD
Project





Mind your Figures!





Figures and Captions (In Project Reports)

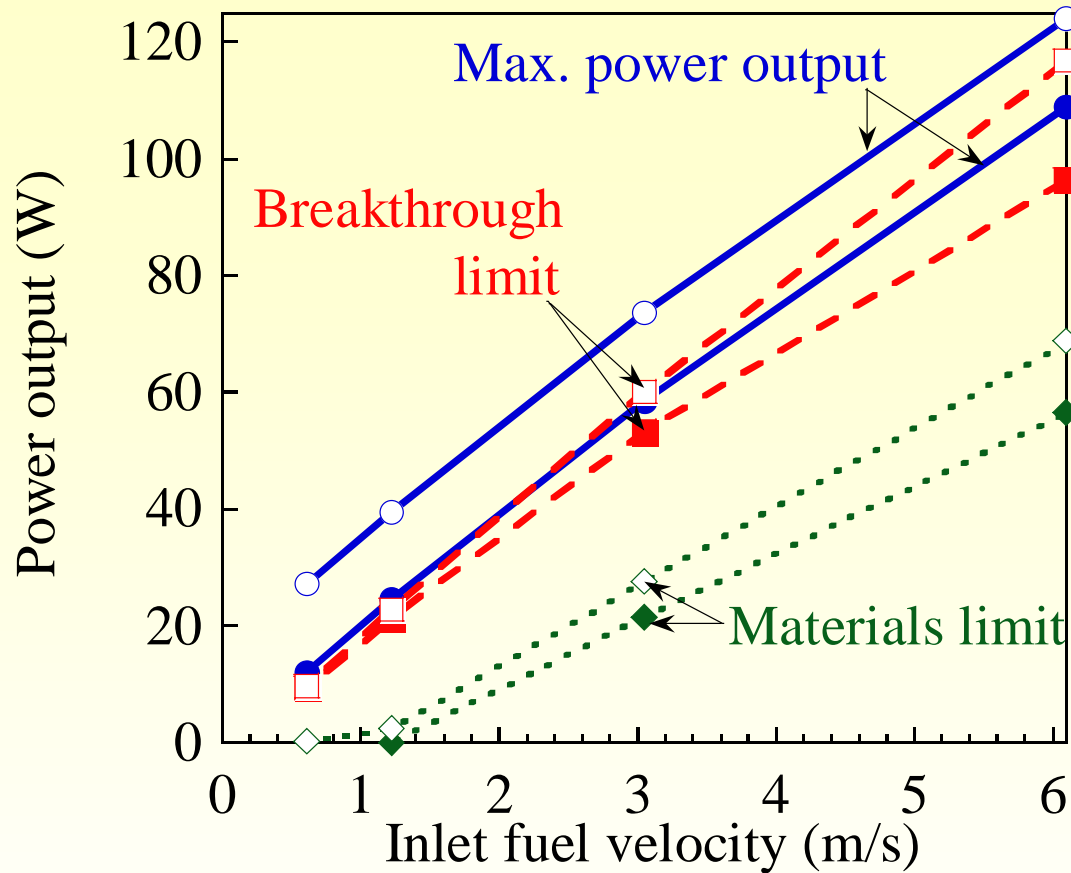


Figure 5: The effect of inlet fuel velocity on the power output for highly conducting walls (open symbols) and insulating walls (filled symbols). The circles represent maximum power output, while diamonds represent [...]



Citations

- Appropriately cite the relevant literature
- Give credit for ideas, data and prior work
- Citation style: **Chemical Engineering Science**

In running text

Kaisare et al. (2008) showed that propane catalytic combustion is diffusion limited

Parenthetical citation

Propane combustion in catalytic microburners is diffusion limited (Kaisare et al., 2008).

Bibliography Style

Kaisare N. S., Deshmukh S. R. and Vlachos D. G. (2008). "Stability and Performance of Catalytic Microreactors: Simulations of Propane Catalytic Combustion on Pt," *Chemical Engineering Science*, 63, 1098-1116.



Things to Remember

- JEE/GATE rank is your past; this is your present.
- This is your thesis, not your advisor's
 - You own responsibility for mistakes; credit for success
- Science relies on data and evidence
 - Even Newton was wrong!
- Research is not a marketing / sales pitch
- Learn to **listen**, **read** and **learn**!
- **Implementation** is the key



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- Colleagues
 - Dr. R. Ramnarayanan
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 - Simon Peyton Jones, Microsoft Research
 - Dr. Scott Keogh, Australian National U.
 - Dr. David R. Caprette, Rice U.
 - Garr Reynolds, <http://www.presentationzen.com>