

Badriprasad Ananthanarayanan

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Education

Ph.D., Chemical Engineering: University of California, Santa Barbara, CA (2002-present)
Thesis Topic: Surface display of cell-adhesive peptides using self-assembly
Advisor: Prof. Matthew Tirrell

B.S., Chemical Engineering: Institute of Chemical Technology, Mumbai (1998-2002)
(Formerly University of Mumbai Department of Chemical Technology (UDCT))
First class with distinction

Research Projects

Multi-component peptide surfaces for stem cell bioengineering (2007-present)
(Collaboration with Prof. David Schaffer and Prof. Kevin Healy, UC Berkeley)

The aim of this project is to develop fully defined substrates that can support adhesion and either self-renewal or directed differentiation of human embryonic stem cells and neural stem cells, using supported bilayers incorporating multiple peptide amphiphiles.

Cell adhesion to peptide-functionalized bilayers (2005-2008)

This project focused on the efficient presentation of GRGDSP peptides on supported bilayers. Studied the effect of peptide concentration and ethylene glycol spacers on RGD-specific adhesion of NIH 3T3 fibroblasts. Established the optimal peptide density and PEG spacer length.

Self-assembled peptide micelles for therapeutic applications (2007-2008)

This project involved the physicochemical characterization of self-assembled micelles consisting of peptide amphiphiles and DSPE-PEG(2000) lipids. Identified and characterized a phase transition due to vitrification of the micellar core that results in increased micellar stability.

Supported lipid bilayers formed by vesicle fusion (2003-2005)

Studied and optimized the fabrication of supported lipid bilayers incorporating peptide amphiphiles on glass surfaces via fusion of uni-lamellar vesicles, using fluorescence microscopy, FRAP, AFM, and QCM.

Publications

M. Kastantin, **B. Ananthanarayanan**, P. Karmali, E. Ruoslahti, and M. Tirrell. 'Effect of the lipid chain melting transition on the stability of DSPE-PEG(2000) micelles'. *Langmuir* (Submitted for publication).

M. Kastantin, **B. Ananthanarayanan**, B. Lin, J. Ressler, M. Black, and M. Tirrell. 'Increase of fluorescence anisotropy upon self-assembly in headgroup-labeled surfactants'. *Macromolecular Bioscience*, **7**, 189 (2007).

B. Ananthanarayanan, D. Missirlis, A. Chworos, M. Black, and M. Tirrell. 'Effect of RGD density and spacer length on cell adhesion to peptide-functionalized lipid bilayers'. *Manuscript in preparation*.

B. Ananthanarayanan, L. Little, W.-H. Suh, D. Schaffer, K. Healy and M. Tirrell. 'RGD peptide-modified phospholipid bilayers support adhesion and proliferation of neural progenitor cells'. *Manuscript in preparation*.

D. Missirlis, M. Farine, H. Khant, M. Kastantin, **B. Ananthanarayanan**, and M. Tirrell. 'Physicochemical characterization of micelles based on p53₁₄₋₂₉ tumor suppressor peptide amphiphiles'. *Manuscript in preparation*.

M. Kastantin, M. Black, D. Missirlis, P. Karmali, **B. Ananthanarayanan**, R. Marullo, V. Kotamraju, E. Ruoslahti and M. Tirrell. 'A micellar platform for *in vivo* nanomedicine'. *Manuscript in preparation*.

Conference presentations and posters

B. Ananthanarayanan, M. Black, D. Missirlis, and M. Tirrell. 'Fabrication of biofunctional surfaces displaying multiple peptide ligands using supported bilayers'. **MRS Spring Meeting**, San Francisco, CA, 2008.

B. Ananthanarayanan and M. Tirrell. 'A supported-bilayer based surface display system for cell-adhesive peptide ligands'. **AIChE Annual Meeting**, Salt Lake City, UT, 2007.

B. Ananthanarayanan, D. Stroumpoulis and M. Tirrell. 'Supported bilayers incorporating cell-adhesive RGD ligands: composition, structure and function'. **AIChE Annual Meeting**, San Francisco, CA, 2006.

B. Ananthanarayanan and M. Tirrell. 'Ligand mobility in supported bilayers and its effect on cell adhesion'. **Biophysical Society 50th Annual Meeting**, Salt Lake City, UT, 2006 (*poster*).

Research skills

Solid-phase peptide synthesis and synthesis of fluorescent/amphiphilic peptides
Solution-phase organic reactions (including air-sensitive methods)
HPLC; MALDI-TOF and ESI-TOF mass spectrometry
Static and Dynamic Light Scattering
Atomic Force Microscopy (including fluid samples)
Microfabrication (standard lithography and soft lithography)
Mammalian cell culture (including stem cells)
Fluorescence microscopy and immunocytochemistry
Flow cytometry and FACS

Matlab programming

Teaching and Mentoring Experience

Teaching assistant in Chemical Engineering at UCSB (2003-2007).

Directed and evaluated research conducted by six undergraduate students as part of the NSF-funded RICE, INSET, EPSEM and SIMS programs at UCSB.

Awards and Honors

UCSB Materials Research Laboratory Travel Fellowship. 2006, 2008.

Ranked 18th of around 200,000 in the Higher Secondary Certificate (HSC) examination conducted by the State of Maharashtra (India), 1998.

All India Talent Scholarship for high school education (Children's Education Trust of India), 1991.

Professional Affiliations

Member of the American Institute of Chemical Engineers, Biophysical Society, Materials Research Society and the American Association for the Advancement of Science.

References

Prof. Matthew Tirrell

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Prof. Jacob Israelachvili

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Prof. David V. Schaffer

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