

# *Short Catalytic Peptides for Carbon Dioxide Sequestration*



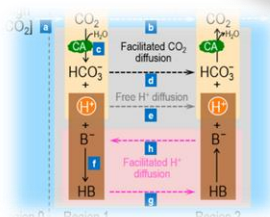
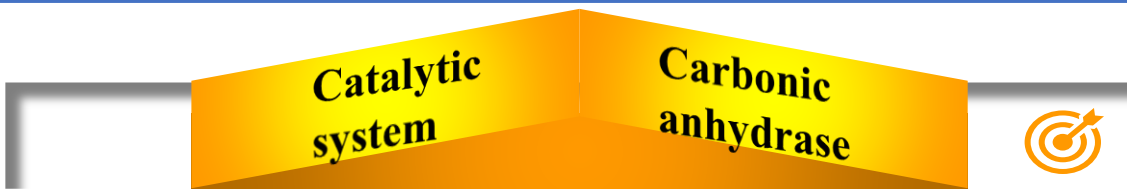
Young Investigators Mini Symposium Flash Communications

**Kalpana Kumari**  
**Doctor of Philosophy**

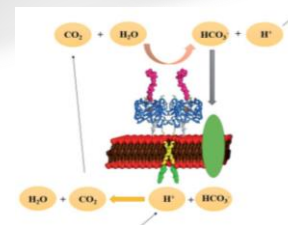
**Molecular Informatics & Design Laboratory**  
**Biosciences & Bioengineering**  
**IIT Guwahati, Assam, India**  
**Supervisor: Vibin Ramakrishnan**

**37<sup>th</sup> European Peptide Symposium**  
**14<sup>th</sup> International Peptide Symposium**  
**25<sup>th</sup> - 29<sup>th</sup> August 2024**  
**Florence, Italy**

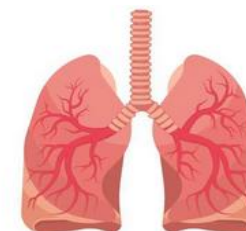
# Motivation and Problem Statement



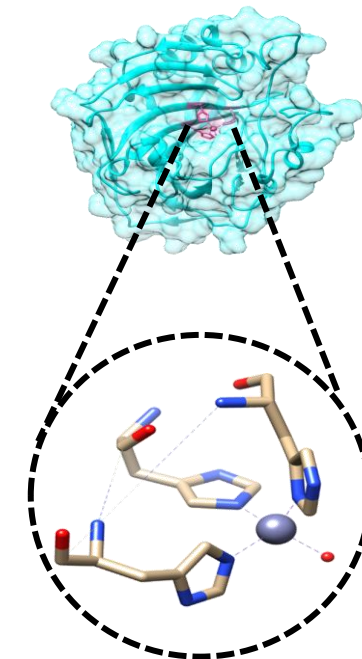
Fluid secretion



pH control



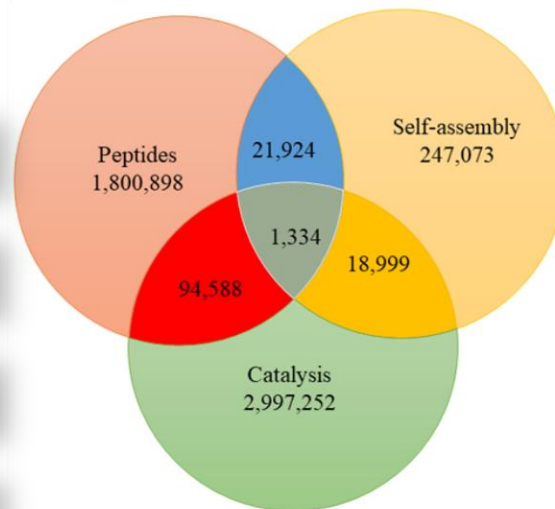
Respiration



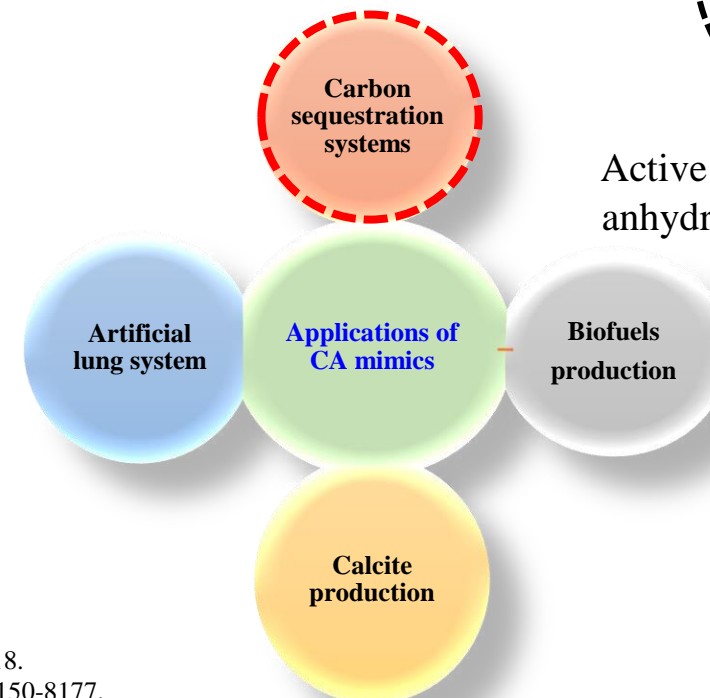
Active site of human carbonic anhydrase II (PDB ID:2CBA)

## Why peptide catalyst?

- 1 Self-assembly
- 2 Inherent biological origin
- 3 Biocompatible & Biodegradable
- 4 Low immunogenicity

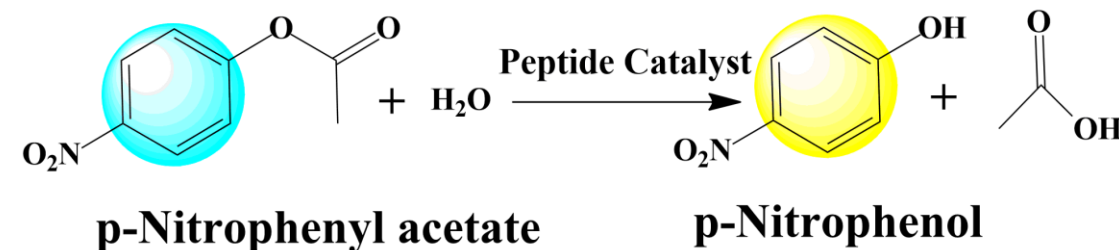
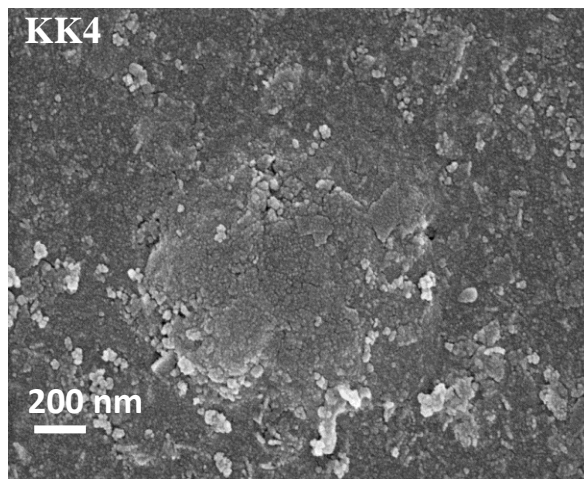
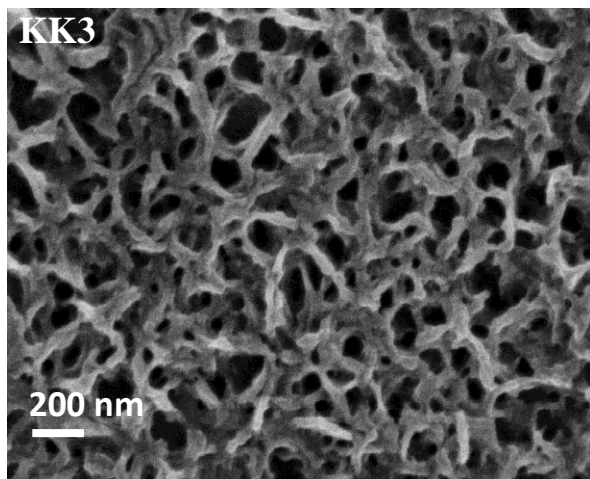
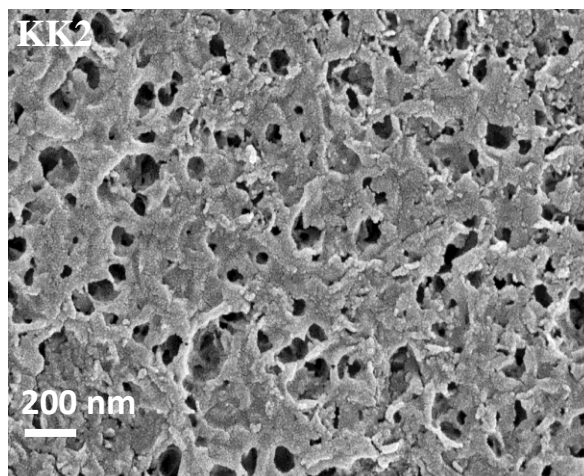
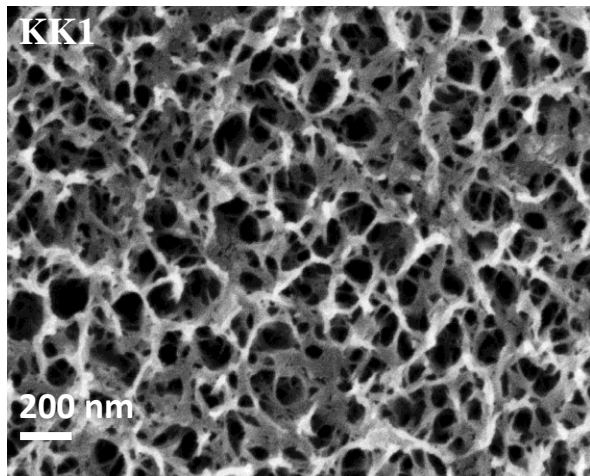


SciFinder, as of 5th March 2018



# Work done on Problem

## Morphological Characterization of Designed Peptides by Field-Emission Scanning Electron Microscope



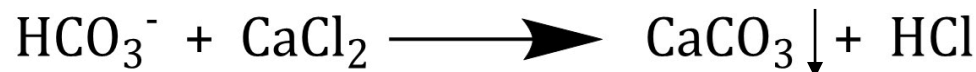
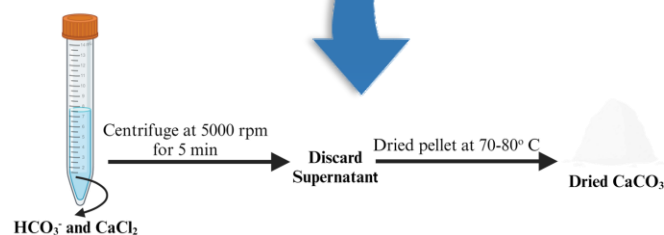
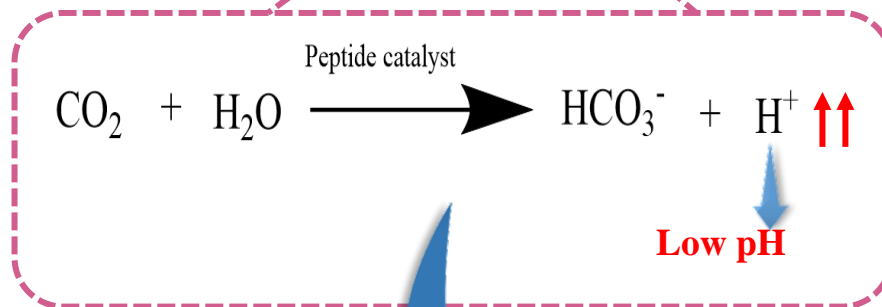
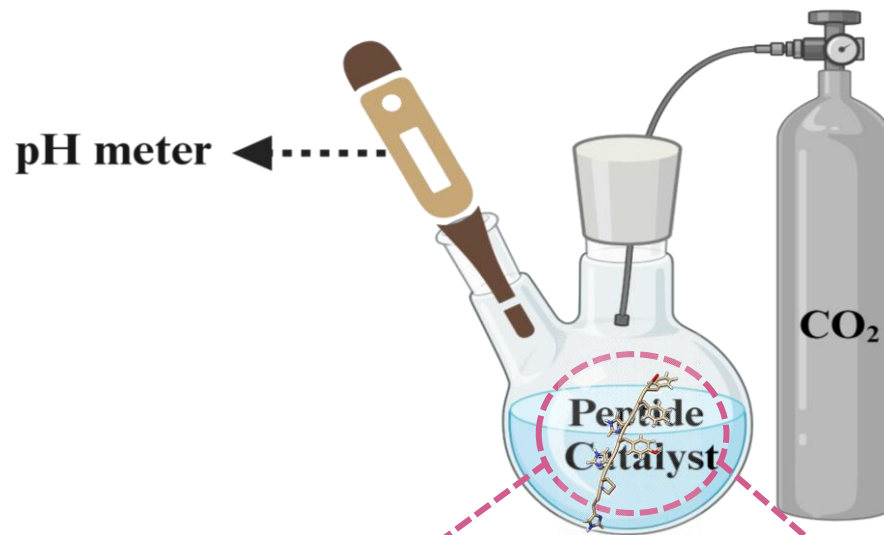
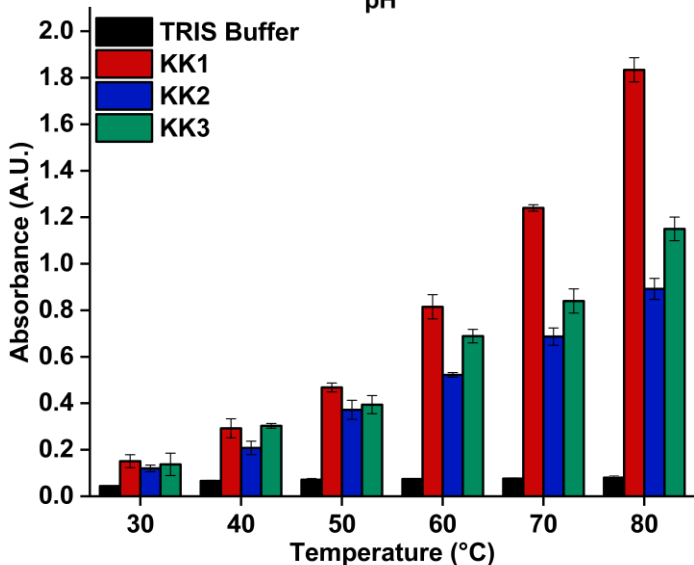
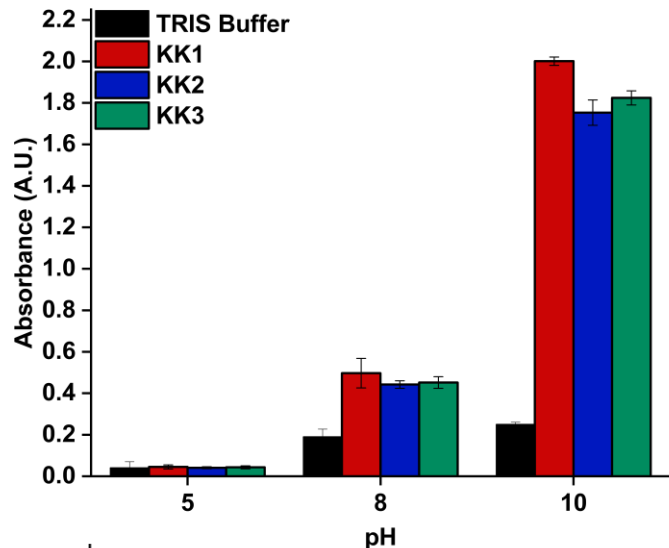
### Kinetic parameters of Peptide Catalysts

Kinetic parameters	KK1	KK2	KK3	KK4
$v_{\max}$ (mM/s)	$9.39 \times 10^{-4}$	$0.41 \times 10^{-4}$	$6.18 \times 10^{-4}$	(No activity)
$K_M$ (mM)	0.131	0.329	0.212	-
$K_{\text{cat}} = v_{\max} / \text{Peptide concentration}$ (s <sup>-1</sup> )	$93.9 \times 10^{-4}$	$4.1 \times 10^{-4}$	$61.8 \times 10^{-4}$	-
Catalytic efficiency = $K_{\text{cat}} / K_M$ (M <sup>-1</sup> s <sup>-1</sup> )	71.67	1.246	29.15	-



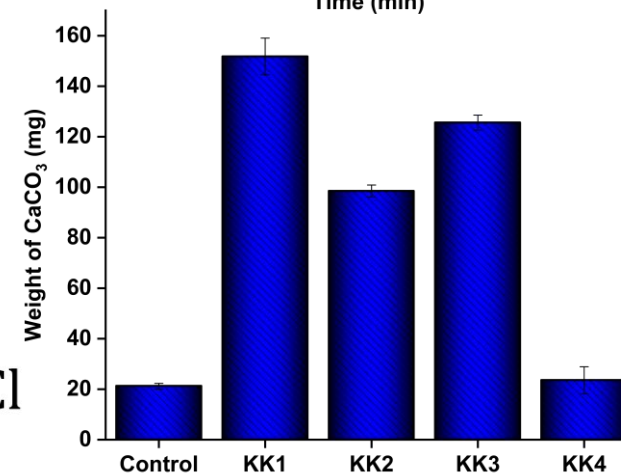
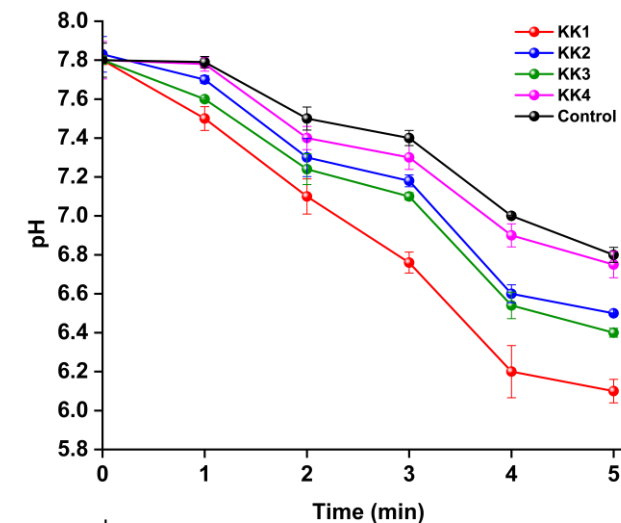
# Work done on Problem

## Catalytic Activity of Peptide at varying pH and Temperature



Patent Filed: R20243014268

## pH changes during the hydration of CO<sub>2</sub> Followed by Formation of CaCO<sub>3</sub> during Sequestration in the Presence of Different Catalysts



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**Thank You**

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