

**Comparative analysis of physicochemical and anti-biofilm properties of
iota and lambda carrageenan capped silver nanocomposites synthesized
using response surface methodology**

Khushboo Rani Singh^a, Aakanksha Pathak^b and Krishna Mohan Poluri^{a,b*}

**^aDepartment of Biosciences and Bioengineering, Indian Institute of Technology
Roorkee, Roorkee-247667, Uttarakhand, India**

**^bCentre for Nanotechnology, Indian Institute of Technology Roorkee, Roorkee-247667,
Uttarakhand, India**

***Corresponding Author:**

Dr. Krishna Mohan Poluri,
Department of Biosciences and Bioengineering,
Indian Institute of Technology Roorkee (IIT-Roorkee),
Roorkee – 247667, Uttarakhand, India
Tel: +91-1332-284779;
E-mail: krishna.poluri@bt.iitr.ac.in / mohanpmk@gmail.com

Figure S1: Desirability ramp for optimisation of factors **(A, E)** A: v/λ -Crg, **(B, F)** B: AgNO_3 and **(C, G)** C: NaOH for response **(D, H)** the average size of the nanoparticles.

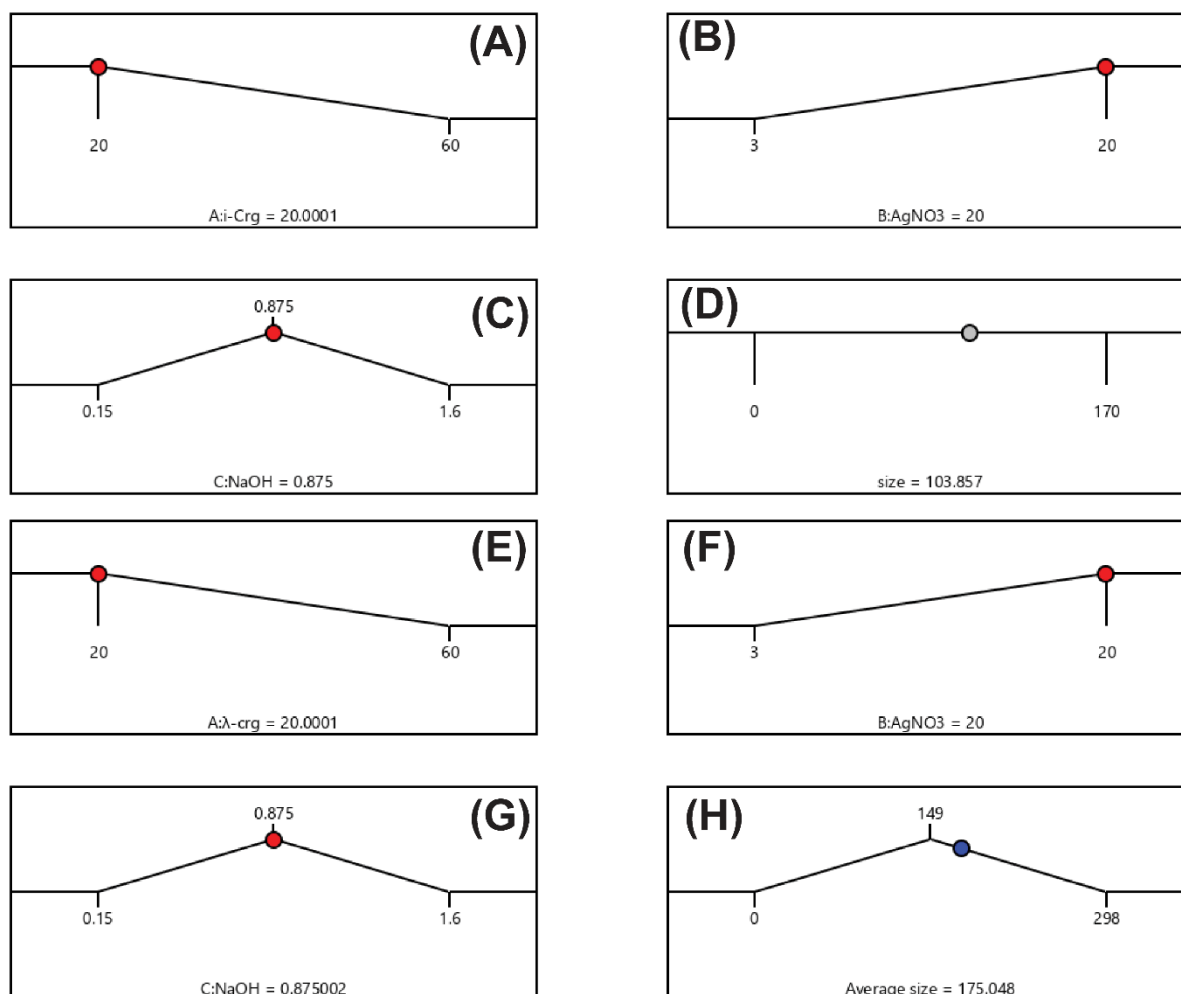


Figure S2: The response verification of nanoparticle size using DLS: **(A)** ι -CrgAgNP and **(B)** λ -CrgAgNP.

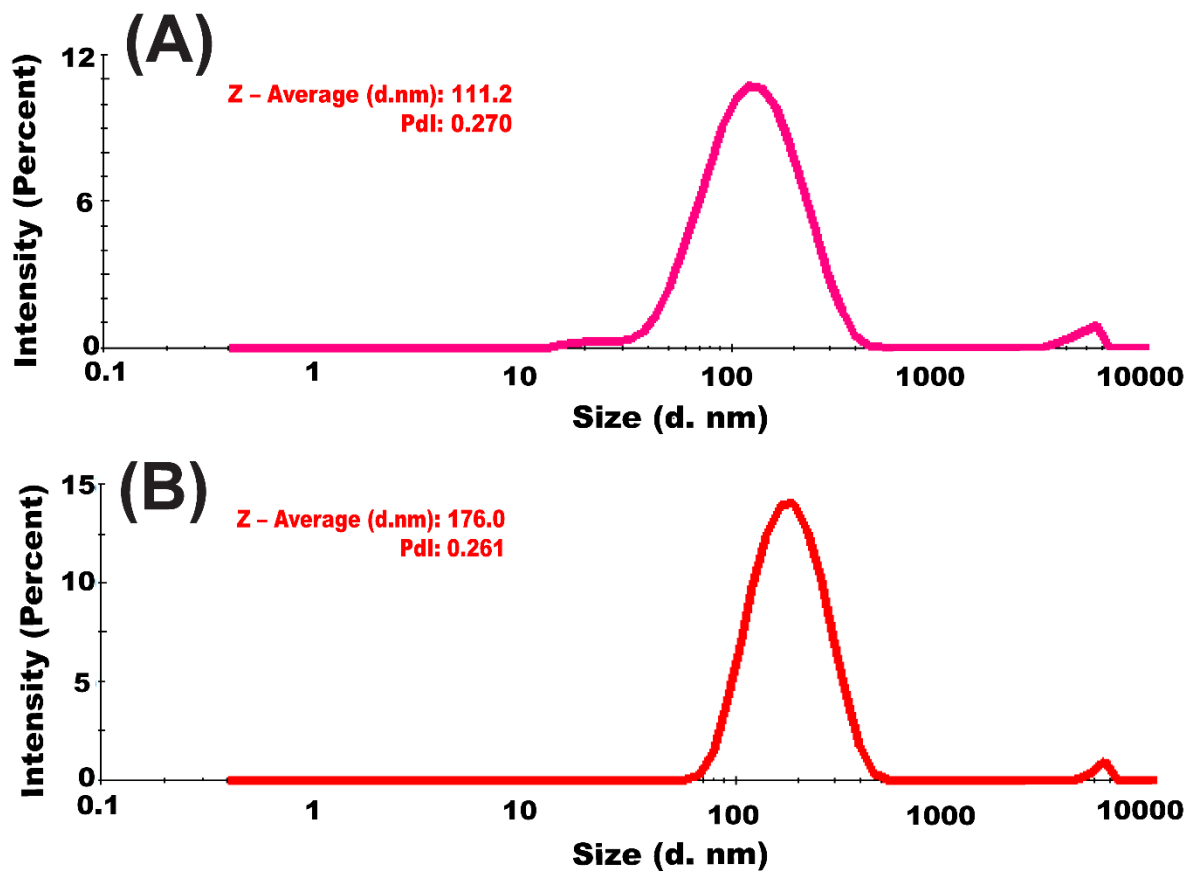


Figure S3: Fluorescence microscopy images of bacterial culture dual stained with AO-EtBr showing: **(A)** *S. aureus* control, **(B)** and **(C)** are treated with ι – CrgAgNP (300 $\mu\text{g}/\text{mL}$) and λ – CrgAgNP (350 $\mu\text{g}/\text{mL}$); **(D)** *P. aeruginosa* control, **(E)** and **(F)** are treated with ι – CrgAgNP (60 $\mu\text{g}/\text{mL}$) and λ – CrgAgNP (60 $\mu\text{g}/\text{mL}$). The scale bar represents 25 μm .

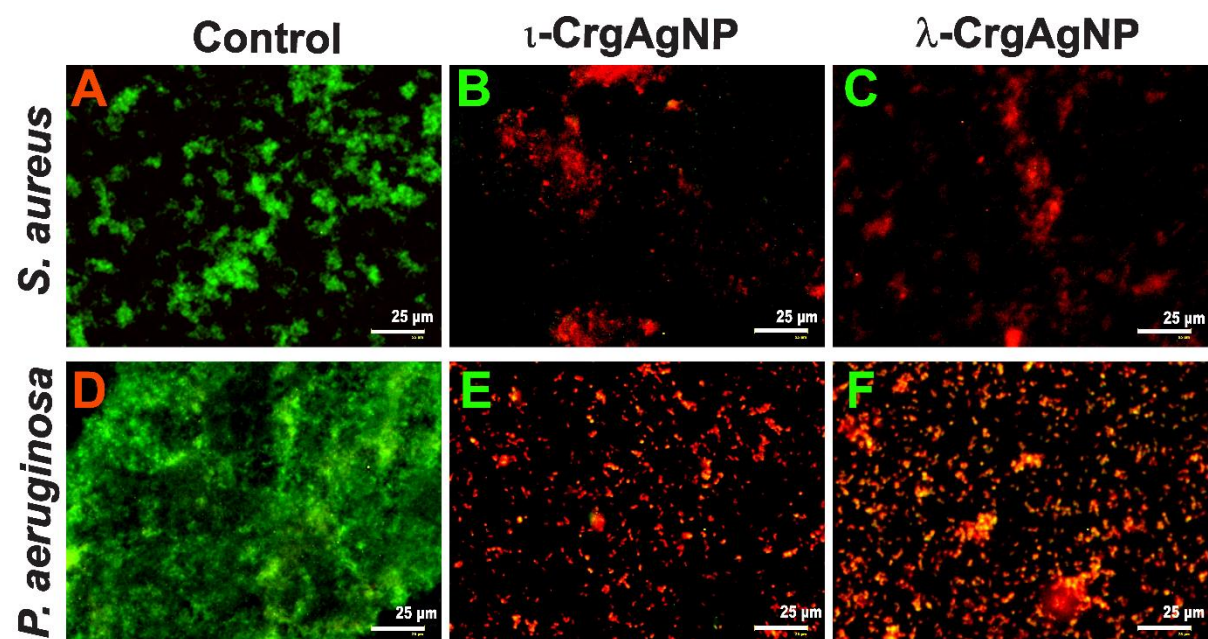


Table S1: Independent variables and their levels in FCCCD design used for the optimization of ι -CrgAgNP/ λ -CrgAgNP synthesis.

Factor	Name	Minimum	Maximum	Coded Low	Coded High	Mean
A	ι -Crg/ λ -Crg (mg)	20.00	60.00	-1 $\leftrightarrow$ 20.00	+1 $\leftrightarrow$ 60.00	40.00
B	AgNO ₃ (mg)	3.00	20.00	-1 $\leftrightarrow$ 3.00	+1 $\leftrightarrow$ 20.00	11.50
C	NaOH (mg)	0.1500	1.60	-1 $\leftrightarrow$ 0.15	+1 $\leftrightarrow$ 1.60	0.8750

Table S2: Analysis of Variance (ANOVA) of quadratic model for optimization in the response of average size of ι -CrgAgNP by FCCCD

Source	Sum of Squares	Mean Square	F-value	p-value	
Model	48674.95	5408.33	24.26	< 0.0001	significant
A-i-Crg	565.50	565.50	2.54	0.1423	
B-AgNO₃	300.30	300.30	1.35	0.2728	
C-NaOH	8133.90	8133.90	36.48	0.0001	
AB	3411.38	3411.38	15.30	0.0029	
AC	6339.38	6339.38	28.43	0.0003	
BC	1959.38	1959.38	8.79	0.0142	
A²	922.09	922.09	4.14	0.0694	
B²	5994.53	5994.53	26.89	0.0004	
C²	19087.15	19087.15	85.61	< 0.0001	
Residual	2229.47	222.95			
Lack of Fit	1680.11	336.02	3.06	0.1227	not significant
Pure Error	549.36	109.87			
Cor Total	50904.42				

Table S3: Analysis of Variance (ANOVA) of quadratic model for optimization in the response of average size of λ -CrgAgNP by FCCCD

Source	Sum of Squares	Mean Square	F-value	p-value	
Model	1.196E+05	13292.94	17.45	< 0.0001	significant
A-λ-crg	202.50	202.50	0.2658	0.6174	
B-AgNO₃	6051.60	6051.60	7.94	0.0182	
C-NaOH	16810.00	16810.00	22.06	0.0008	
AB	10224.50	10224.50	13.42	0.0044	
AC	22684.50	22684.50	29.78	0.0003	
BC	35378.00	35378.00	46.44	< 0.0001	
A²	9780.36	9780.36	12.84	0.0050	
B²	282.55	282.55	0.3709	0.5561	
C²	25802.05	25802.05	33.87	0.0002	
Residual	7618.54	761.85			
Lack of Fit	5285.04	1057.01	2.26	0.1953	not significant
Pure Error	2333.50	466.70			
Cor Total	1.273E+05				