

## **Optimized BN-CQD Fluorescence Quenching Method for Rivaroxaban Determination in Pharmaceutical and Biological Samples: Mechanistic Insights, Validation, and Greenness Assessment**

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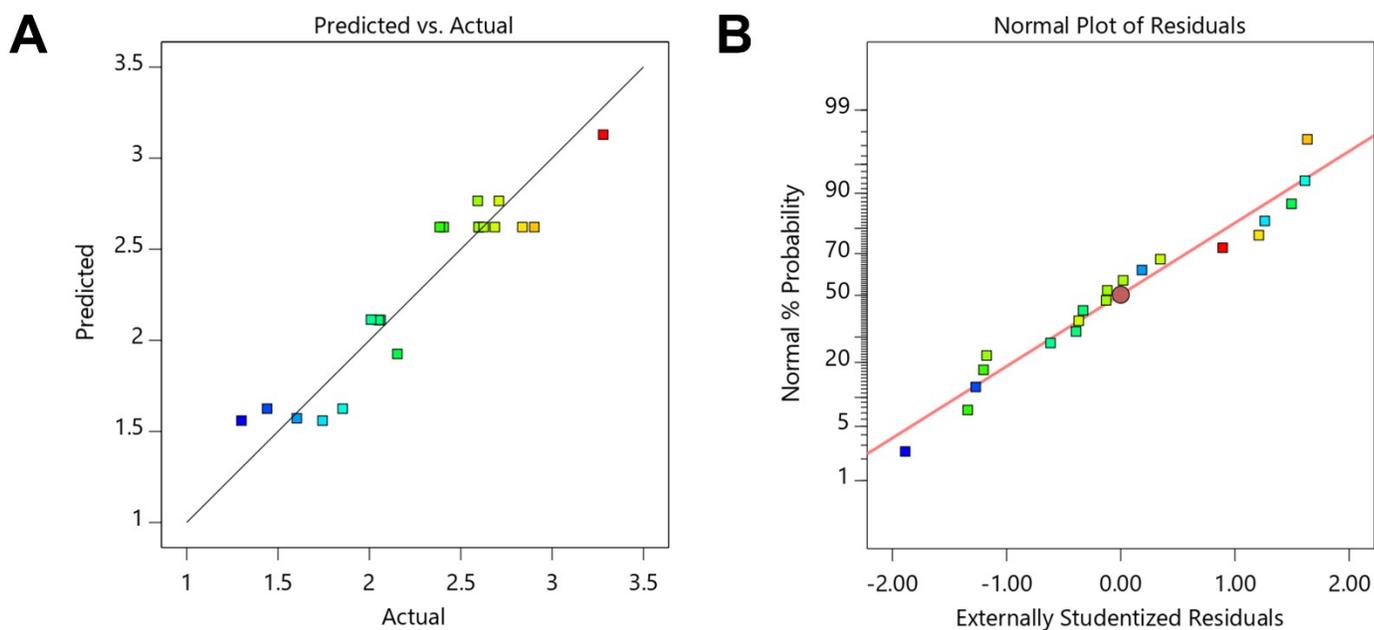
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**Table S1:** Central composite design matrix showing experimental conditions for pH, BN-CQDs volume, and incubation time optimization.

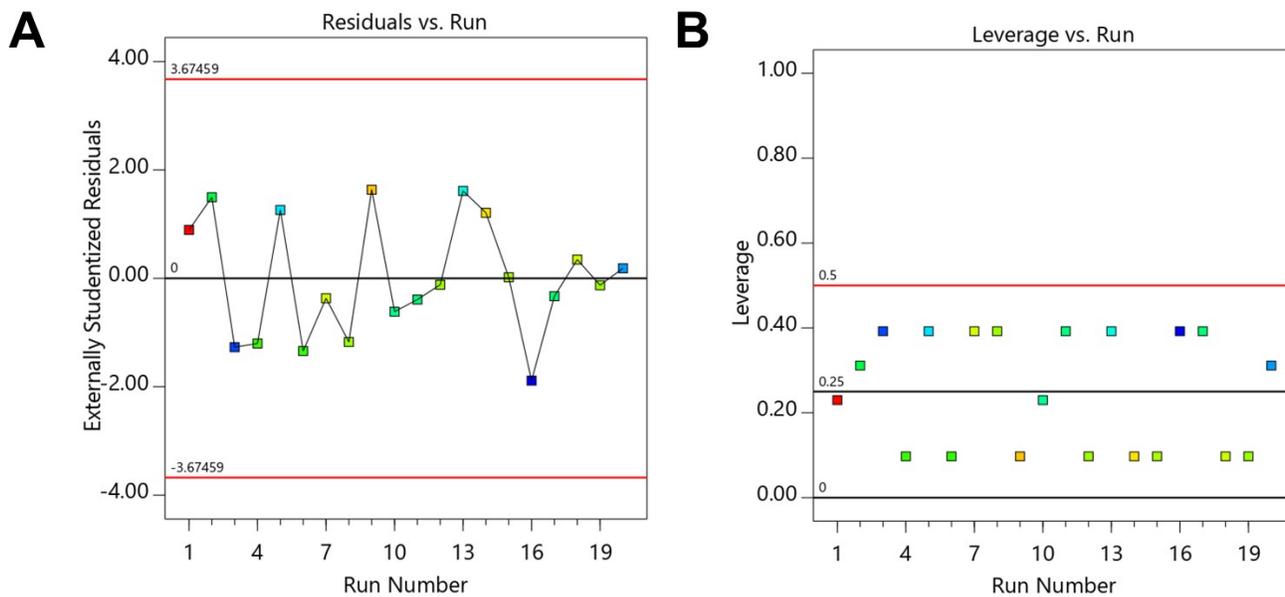
		<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>
<b>Std</b>	<b>Run</b>	<b>A:pH</b>	<b>B:BN-CQDs Volume</b>	<b>C:Time</b>
			mL	min
<b>12</b>	1	7.5	1.6	3
<b>10</b>	2	10.5	1	3
<b>1</b>	3	5	0.5	1
<b>14</b>	4	7.5	1	5.4
<b>2</b>	5	10	0.5	1
<b>20</b>	6	7.5	1	3
<b>4</b>	7	10	1.5	1
<b>8</b>	8	10	1.5	5
<b>13</b>	9	7.5	1	0.6
<b>11</b>	10	7.5	0.4	3
<b>7</b>	11	5	1.5	5
<b>15</b>	12	7.5	1	3
<b>5</b>	13	5	0.5	5
<b>16</b>	14	7.5	1	3
<b>19</b>	15	7.5	1	3
<b>6</b>	16	10	0.5	5
<b>3</b>	17	5	1.5	1
<b>18</b>	18	7.5	1	3
<b>17</b>	19	7.5	1	3
<b>9</b>	20	4.5	1	3

**Table S2:** ANOVA results for the reduced quadratic model of fluorescence quenching response (F0/F).

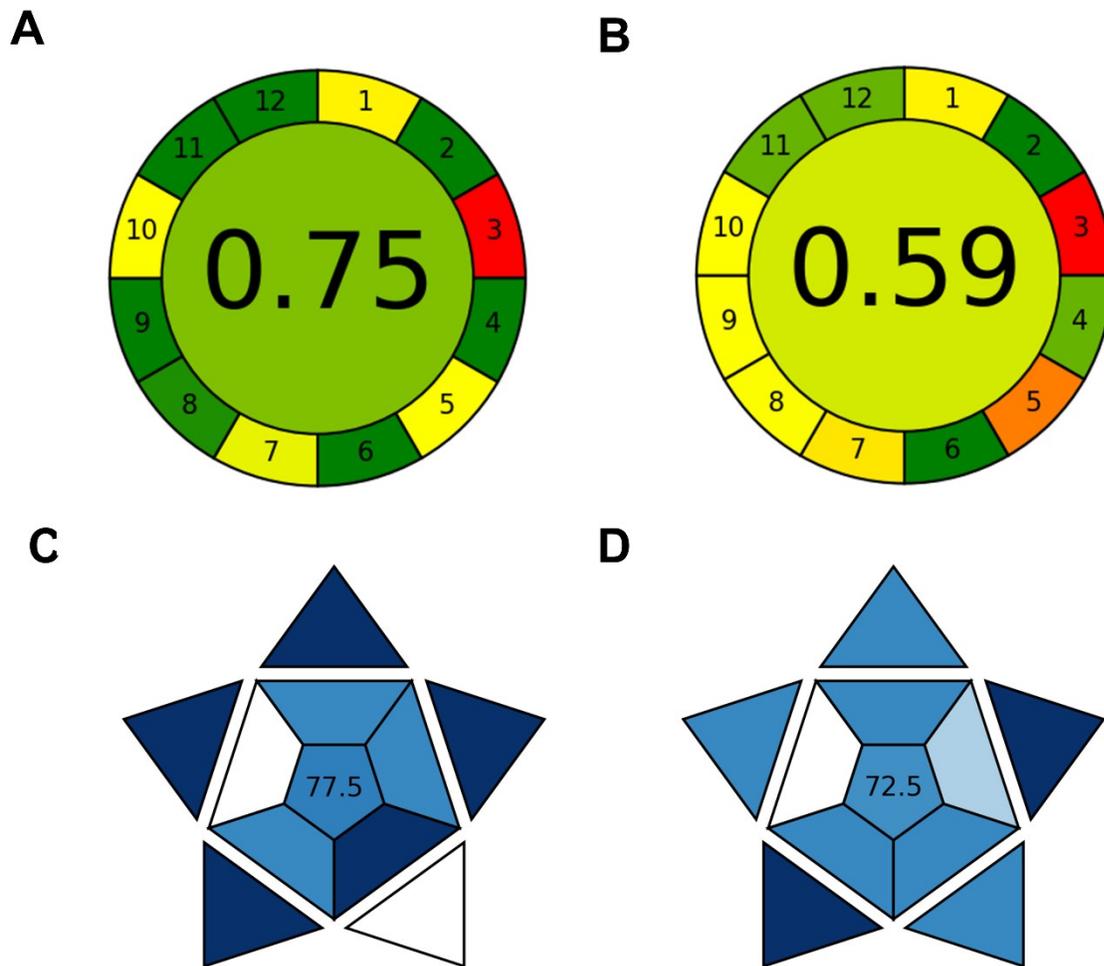
Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	4.73	4	1.18	32.46	< 0.0001	significant
<b>A-pH</b>	0.2354	1	0.2354	6.46	0.0226	
<b>B-BN-CQDs</b>	1.95	1	1.95	53.46	< 0.0001	
<b>Volume</b>						
<b>AB</b>	0.2588	1	0.2588	7.10	0.0177	
<b>A<sup>2</sup></b>	2.29	1	2.29	62.81	< 0.0001	
Residual	0.5465	15	0.0364			
<b>Lack of Fit</b>	0.4385	10	0.0439	2.03	0.2249	not significant
<b>Pure Error</b>	0.1080	5	0.0216			
Cor Total	5.28	19				



**Fig. S1:** (A) Predicted vs. actual values showing good agreement between experimental data and model predictions. (B) Normal probability plot of externally studentized residuals demonstrating normal distribution of residuals and validating model assumptions.



**Fig. S2:** (A) Run versus studentized residuals plot showing the distribution of model residuals across experimental runs. (B) Run versus leverage plot demonstrating the influence of individual experimental runs on the model fit.



**Fig. S3:** Environmental impact and analytical practicality assessment using AGREE and BAGI tools. (A, B) AGREE wheels showing greenness scores of 0.75 and 0.59 for the BN-CQDs and HPLC methods, respectively (green: compliant, yellow: partially compliant, red: non-compliant). (C, D) BAGI star diagrams displaying analytical practicality scores of 77.5 and 72.5 for the BN-CQDs and HPLC methods, respectively (darker blue indicates better performance).