Electronic Supplementary Material (ESI) for Soft Matter.
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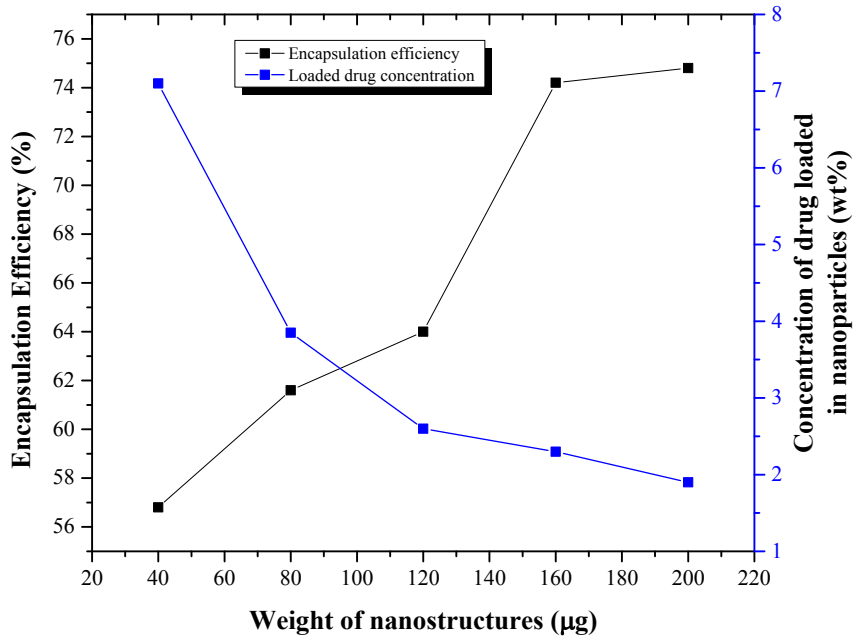
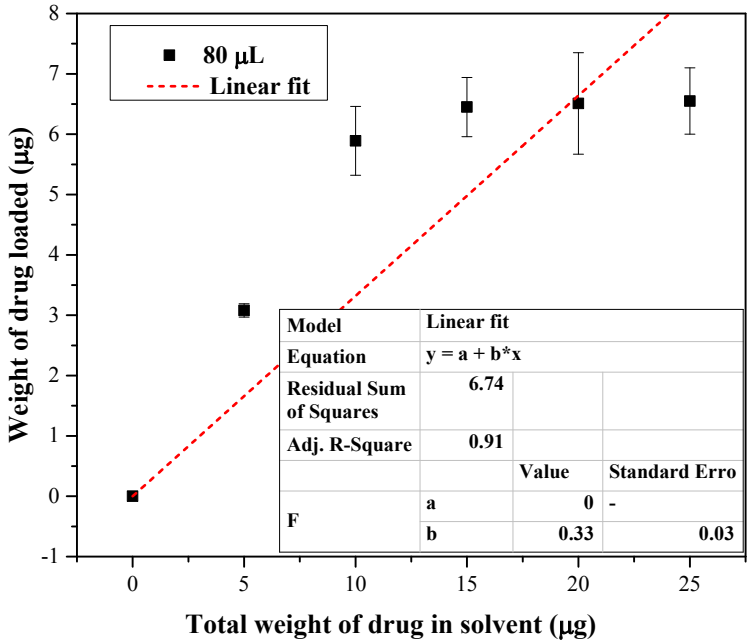
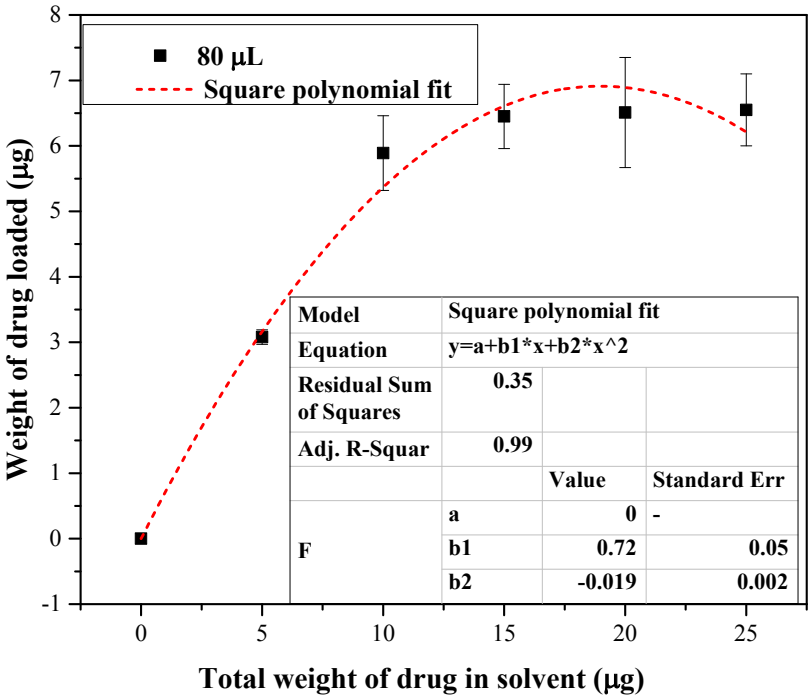


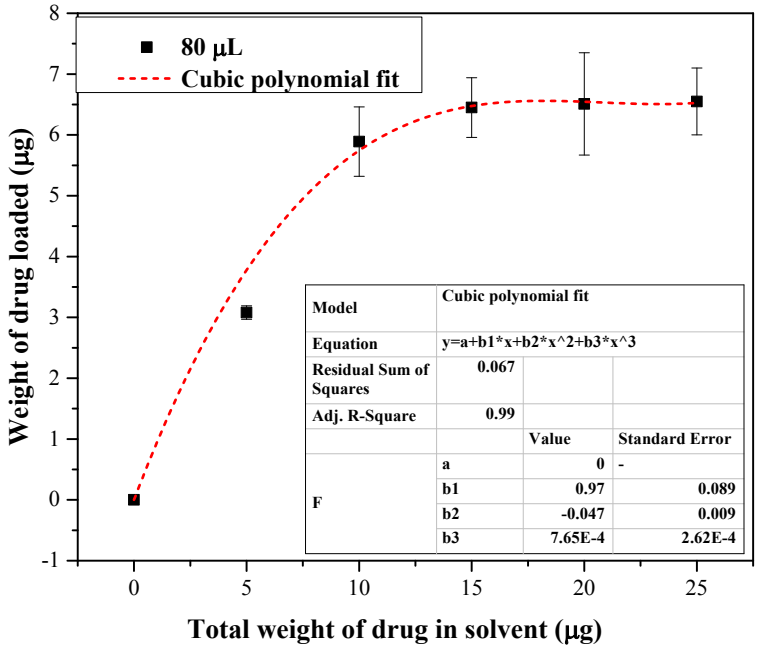

Figure S1: Plot showing encapsulation efficiency and loaded drug concentration for polymer coated nanostructures dispersed in 5 µg of paclitaxel dissolved in DMSO


80 µL
Linear fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
8
7
6
5
4
3
2
1
0
-1
0
5
10
15
20
25
Model Linear fit
Equation y = a + b*x
Residual Sum of Squares 6.74
Adj. R-Square 0.91
Value Standard Erro
F
a 0 -
b 0.33 0.03

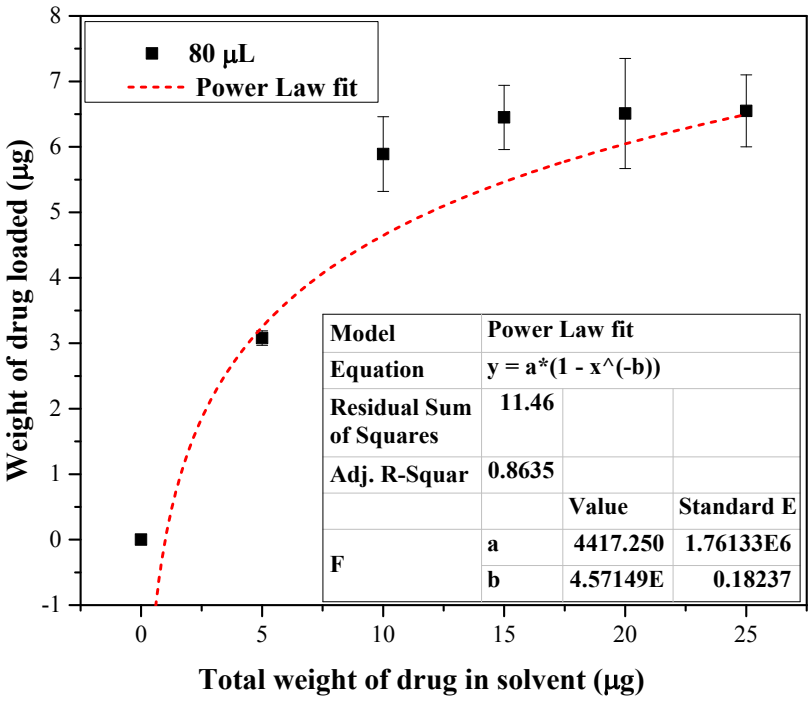
(a)


80 µL
Square polynomial fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model | Square polynomial fit
Equation | y=a+b1*x+b2*x^2
Residual Sum of Squares | 0.35
Adj. R-Squar | 0.99
Value | Standard Err
F | a | 0 | -
b1 | 0.72 | 0.05
b2 | -0.019 | 0.002

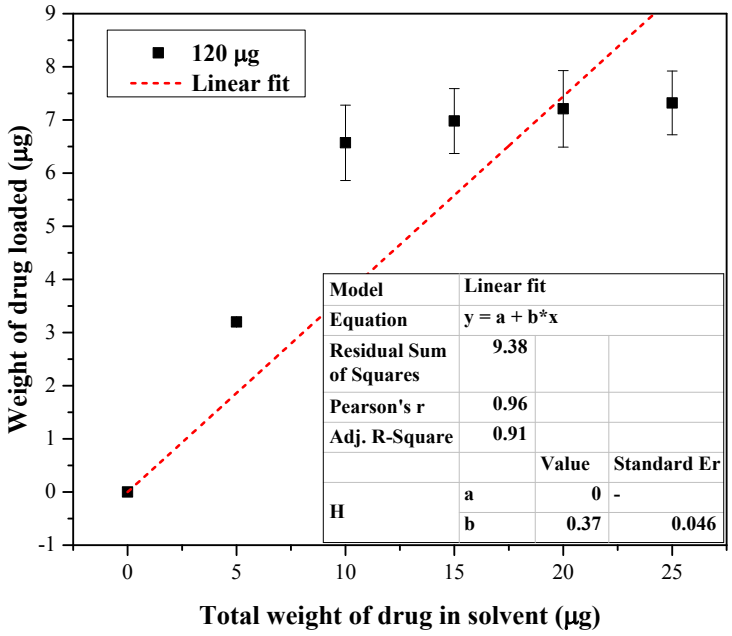
(b)


80 µL
Cubic polynomial fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model | Cubic polynomial fit
Equation | y=a+b1*x+b2*x^2+b3*x^3
Residual Sum of Squares | 0.067
Adj. R-Square | 0.99
Value | Standard Error
F | a | 0 | -
b1 | 0.97 | 0.089
b2 | -0.047 | 0.009
b3 | 7.65E-4 | 2.62E-4

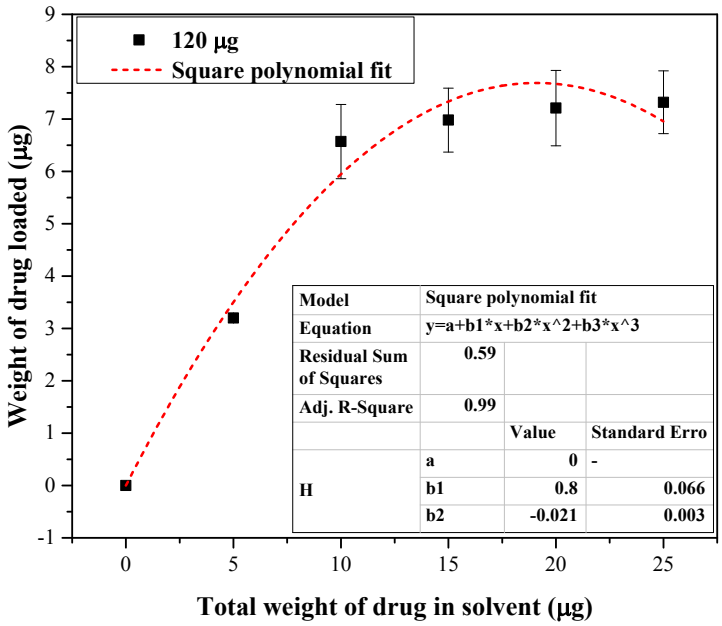
(c)


80 µL
Power Law fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model
Power Law fit
Equation
y = a*(1 - x^(-b))
Residual Sum of Squares
11.46
Adj. R-Squar
0.8635
Value
Standard E
F
a
4417.250
1.76133E6
b
4.57149E
0.18237

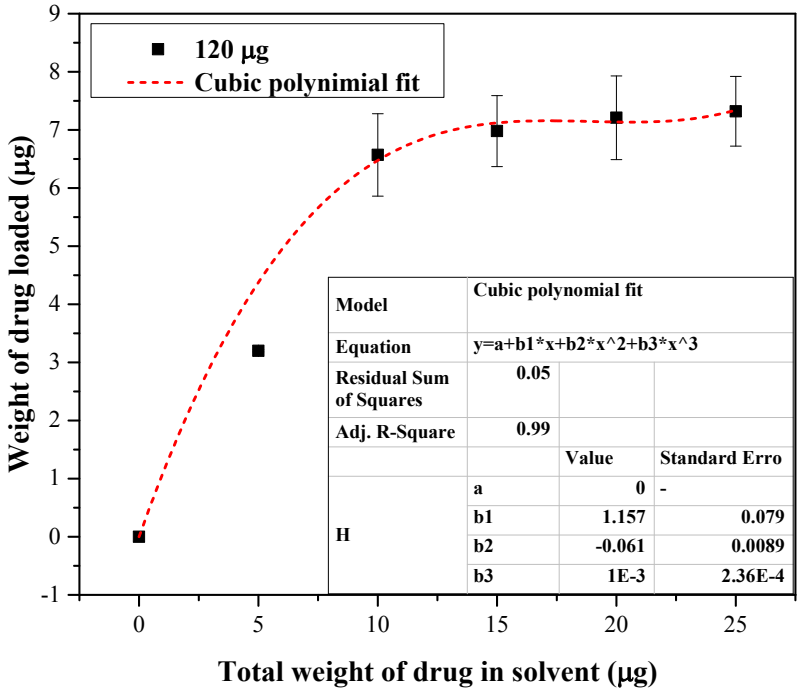
(d)


120 µg
Linear fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model Linear fit
Equation y = a + b*x
Residual Sum of Squares 9.38
Pearson's r 0.96
Adj. R-Square 0.91
Value Standard Er
H a 0 -
b 0.37 0.046

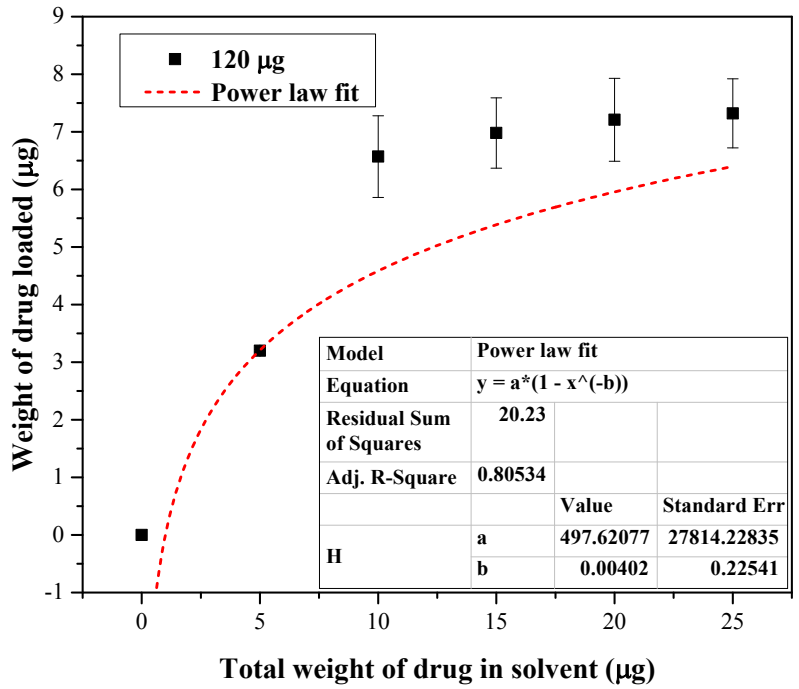
(e)


120 µg
Square polynomial fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model Square polynomial fit
Equation y=a+b1*x+b2*x^2+b3*x^3
Residual Sum of Squares 0.59
Adj. R-Square 0.99
Value Standard Erro
H a 0 -
b1 0.8 0.066
b2 -0.021 0.003

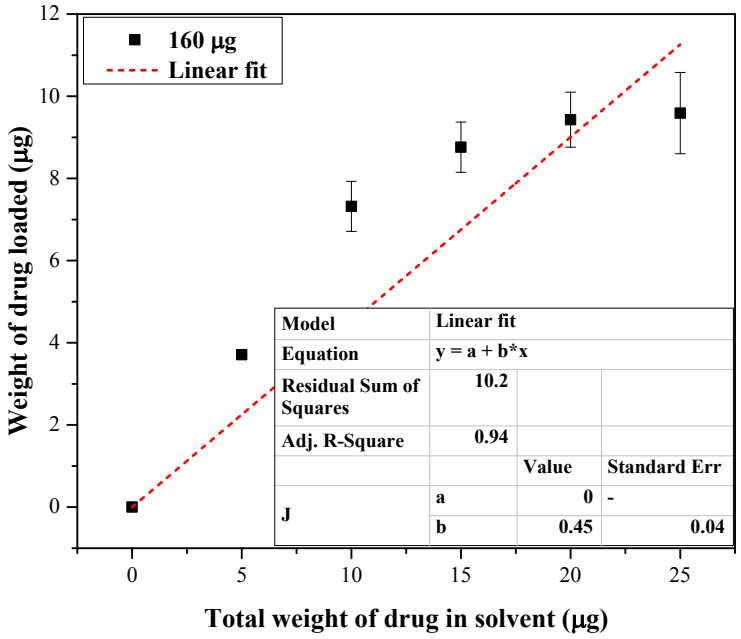
(f)


120 µg
Cubic polynimial fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model | Cubic polynomial fit
Equation | y=a+b1*x+b2*x^2+b3*x^3
Residual Sum of Squares | 0.05
Adj. R-Square | 0.99
Value | Standard Erro
H | a | 0 | -
b1 | 1.157 | 0.079
b2 | -0.061 | 0.0089
b3 | 1E-3 | 2.36E-4

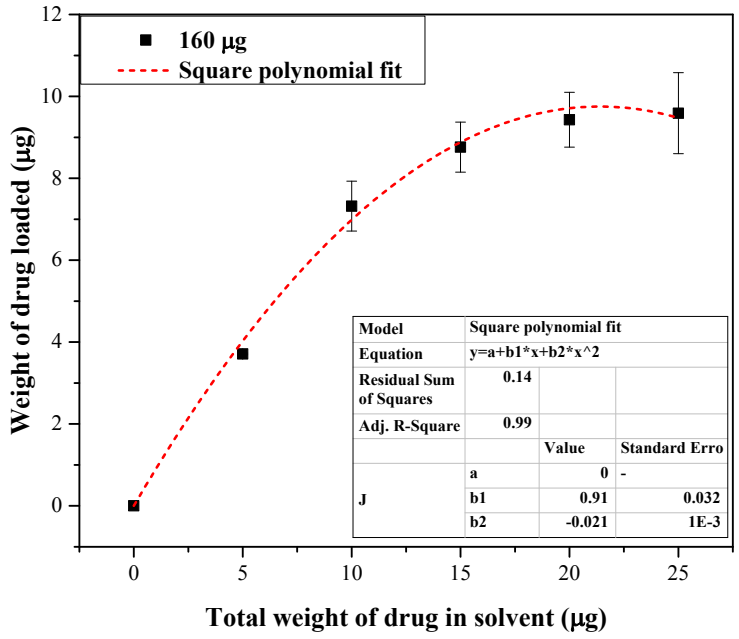
(g)


120 µg
Power law fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model | Power law fit
Equation | y = a*(1 - x^(-b))
Residual Sum of Squares | 20.23
Adj. R-Square | 0.80534
Value | Standard Err
H | a | 497.62077 | 27814.22835
b | 0.00402 | 0.22541

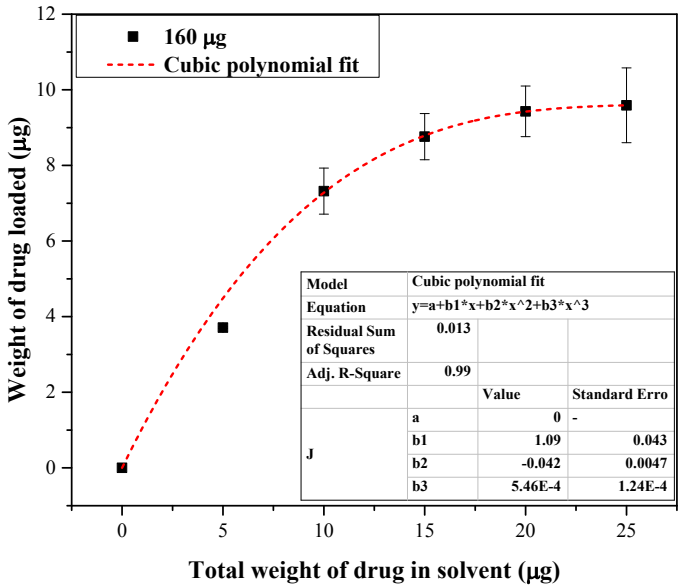
(h)


160 µg
Linear fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
0
2
4
6
8
10
12
0
5
10
15
20
25
Model Linear fit
Equation y = a + b*x
Residual Sum of Squares 10.2
Adj. R-Square 0.94
Value Standard Err
J a 0 -
b 0.45 0.04

(i)

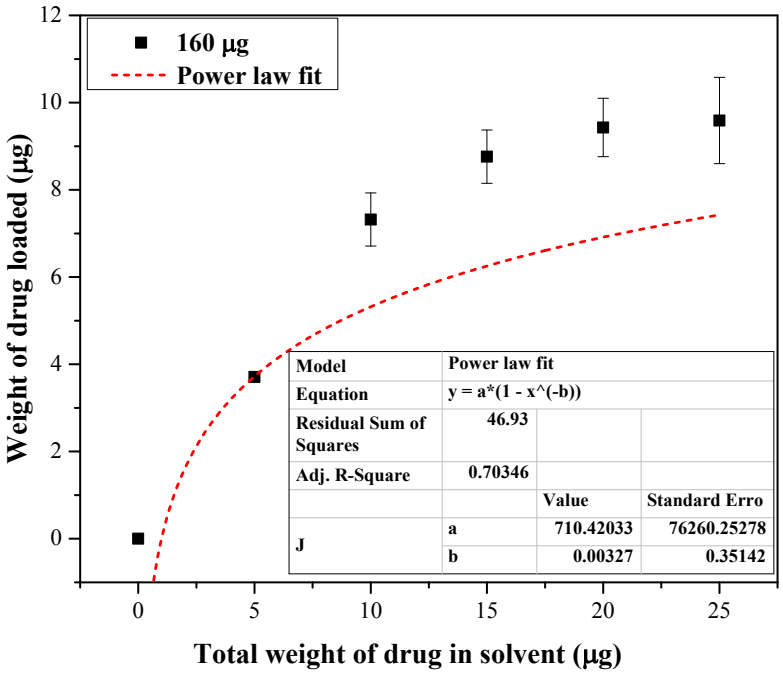

160 µg
Square polynomial fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
0
2
4
6
8
10
12
0
5
10
15
20
25
Model Square polynomial fit
Equation y=a+b1*x+b2*x^2
Residual Sum of Squares 0.14
Adj. R-Square 0.99
Value Standard Erro
J a 0 -
b1 0.91 0.032
b2 -0.021 1E-3

(j)

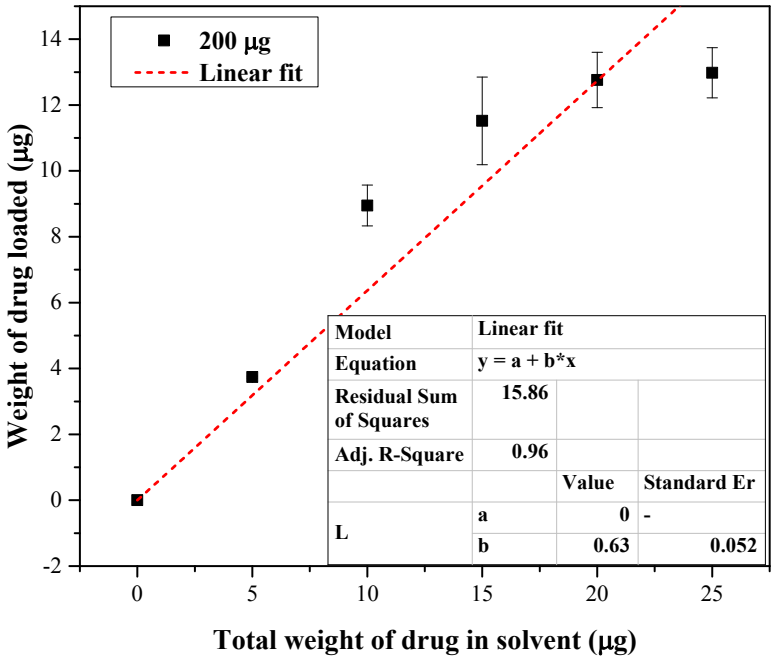



| Model | Cubic polynomial fit | | |
|---|---|---|---|
| Equation | y=a+b1*x+b2*x^2+b3*x^3 | | |
| Residual Sum of Squares | 0.013 | | |
| Adj. R-Square | 0.99 | | |
| | | Value | Standard Erro |
| J | a | 0 | - |
| | b1 | 1.09 | 0.043 |
| | b2 | -0.042 | 0.0047 |
| | b3 | 5.46E-4 | 1.24E-4 |

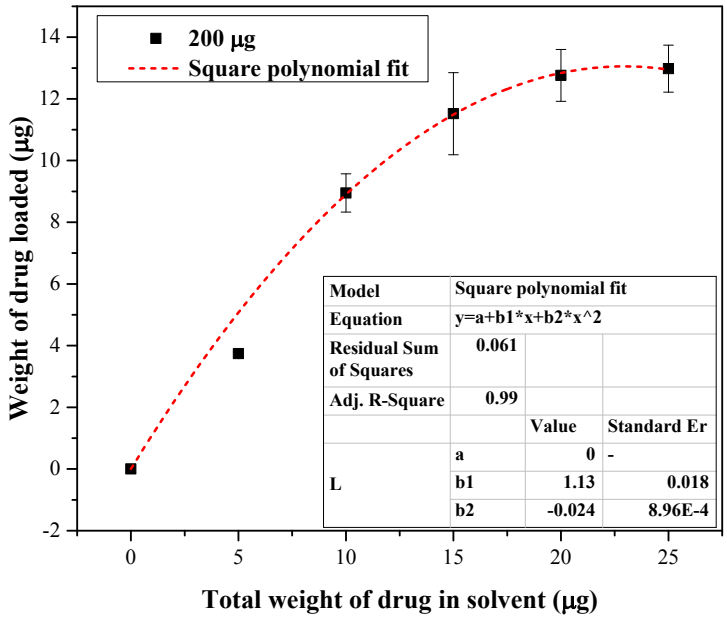
(k)


160 µg
Power law fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
0
2
4
6
8
10
12
0
5
10
15
20
25
Model Power law fit
Equation y = a*(1 - x^(-b))
Residual Sum of Squares 46.93
Adj. R-Square 0.70346
Value Standard Erro
J a 710.42033 76260.25278
b 0.00327 0.35142

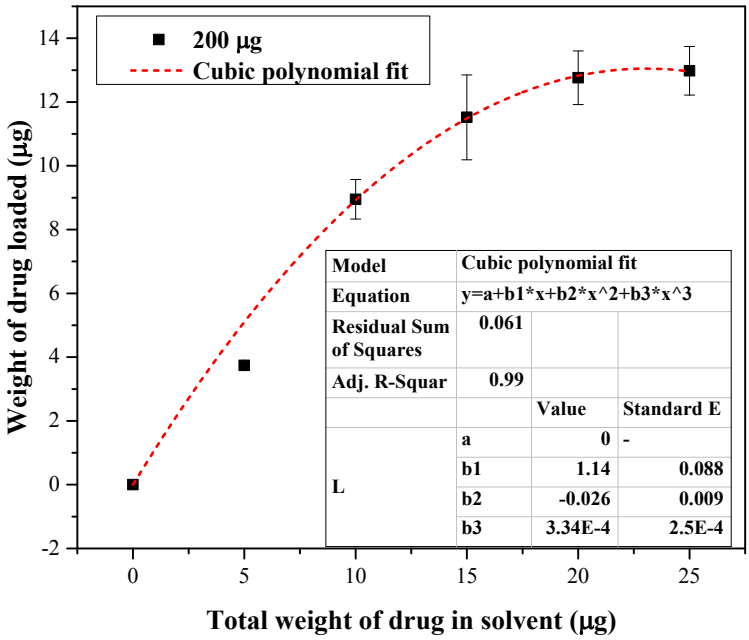
(l)


200 µg
Linear fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model | Linear fit
Equation | y = a + b*x
Residual Sum of Squares | 15.86
Adj. R-Square | 0.96
Value | Standard Er
L | a | 0 | -
b | 0.63 | 0.052

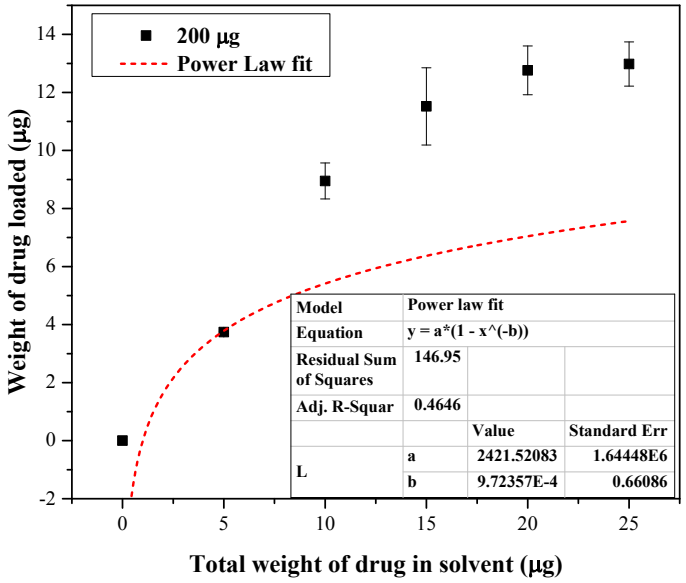
(m)


200 µg
Square polynomial fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model | Square polynomial fit
Equation | y=a+b1*x+b2*x^2
Residual Sum of Squares | 0.061
Adj. R-Square | 0.99
Value | Standard Er
L | a | 0 | -
b1 | 1.13 | 0.018
b2 | -0.024 | 8.96E-4

(n)

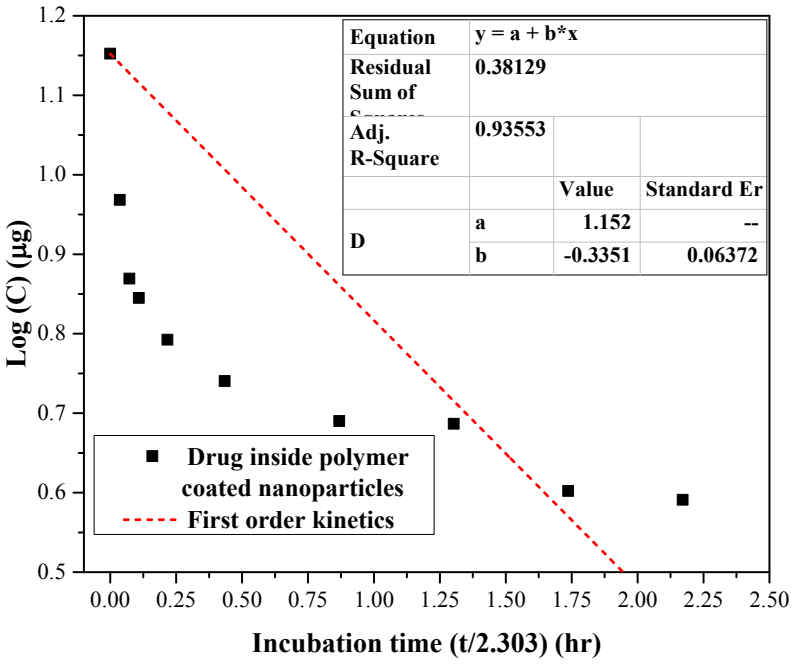

200 µg
Cubic polynomial fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model | Cubic polynomial fit
Equation | y=a+b1*x+b2*x^2+b3*x^3
Residual Sum of Squares | 0.061
Adj. R-Squar | 0.99
Value | Standard E
L | a | 0 | -
b1 | 1.14 | 0.088
b2 | -0.026 | 0.009
b3 | 3.34E-4 | 2.5E-4

(o)

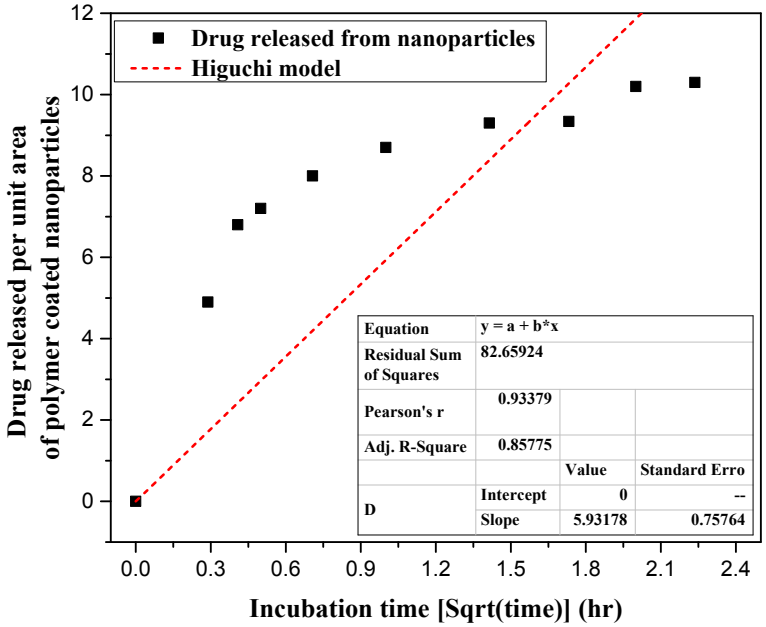

200 µg
Power Law fit
Weight of drug loaded (µg)
Total weight of drug in solvent (µg)
Model | Power law fit
Equation | y = a*(1 - x^(-b))
Residual Sum of Squares | 146.95
Adj. R-Squar | 0.4646
Value | Standard Err
L | a | 2421.52083 | 1.64448E6
b | 9.72357E-4 | 0.66086

(p)

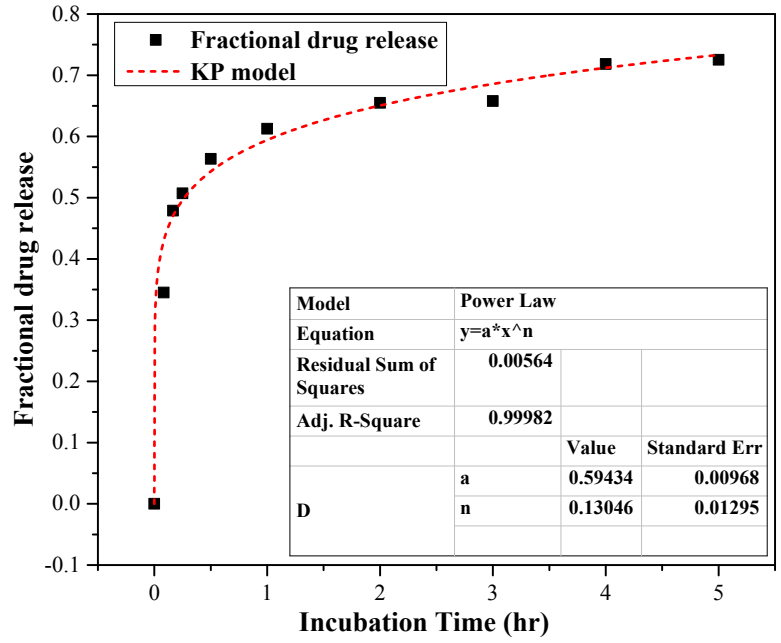
Figure S2: Fitting of various mathematical models on the amount of drug loaded inside polymer matrix on 80g, 120g, 160g and 200g of nanoparticles respectively in DMSO (a, e, i, m) Fitted profile for linear function (b, f, j, n) Square polynomial (c, g, k, o) Cubic polynomial (d, h, l, p) Power law growth.




(a)


Drug released from nanoparticles
Higuchi model
Drug released per unit area of polymer coated nanoparticles
Incubation time [Sqrt(time)] (hr)
Equation y = a + b*x
Residual Sum of Squares 82.65924
Pearson's r 0.93379
Adj. R-Square 0.85775
Value Standard Erro
D Intercept 0 --
Slope 5.93178 0.75764

(b)


Fractional drug release
KP model
Fractional drug release
Incubation Time (hr)
Model Power Law
Equation y=a*x^n
Residual Sum of Squares 0.00564
Adj. R-Square 0.99982
Value Standard Err
D a 0.59434 0.00968
n 0.13046 0.01295

(c)

Figure S3: Fitting of three different drug release models a) First order b) Higuchi c) Korsmeyer-Peppas with the amount of drug released at 41°C from the polymer matrix having drug concentration of 7.1 wt%