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MATERIALS AND METHODS

HCl used was 32% UNIVAR Analytical Reagent grade, the tetraethyl orthosilicate (TEOS) was Reagent Grade 98% obtained from SIGMA-ALDRICH, the cetyl trimethylammonium bromide (CTAB) was obtained from ALDRICH, and the formamide was UNILAB Laboratory Reagent grade. Water with a resistivity greater than 18 MΩ.cm was acquired from a Millipure Milli-Q system. The reactions were carried out in opaque plastic bottles. The molar ratios of the corresponding reagents and reactants were H_2O (10):HCl (0.78):Formamide (1.02):CTAB (0.011):TEOS (0.013). Three batches of reactions were carried out with the pH at 3.18-3.20; 24 ml of 32% HCl solution was added to 100 ml of water followed by 40ml of formamide as a pH stabilizer, then ~ 4 g of CTAB. The mixtures were then sonicated for 1 minute to dissolve the CTABr and the solutions were stirred for 2 days. Curcumin (1 g) and *trans*-β-carotene (0.25g) was added to batches 1 and 2, while batch 3 was used as a control to fabricate mesoporous particles devoid of the nutraceuticals. The three batches were left stirring for 3 days whereupon TEOS (3 ml) was added dropwise with stirring to each batch, and the mixtures were sealed for 5 days without stirring. The samples so obtained were washed repeatedly by ethanol/water mixture. The time scale for the synthesis of the silica particles follows the previous reported methods for the synthesis of mesoporous silica[27].

The rate of release of curcumin and *trans*-β-carotene was studied in aqueous NaOH solution at physiological pH (7.70). The silica particles with encapsulated nutraceuticals were added to 20 ml of the solution in a 100 ml beaker then stirred constantly. Samples (1 ml) were taken at various time intervals and centrifuged with the supernatant liquid studied using UV-visible spectroscopy. The isolated particles were resuspended and

investigated using fluorescence spectroscopy. The release profile studied under UV was calculated using the following equation:

$$\frac{A_t - A_o}{A_o} \times 100$$

A_0 = Area under the curve at time 0 hours
A_t = Area under the curve at time t hours

All optical images were taken using the OLYMPUS IX71 Inverted Research Microscope, the fluorescent images were generated using the OLYMPUS U-RFL-T Burner, and the UV-visible measurements were recorded using the PerkinElmer Lambda 25 UV/Vis Spectrometer. SEM images were taken using the VPSEM Zeiss 1555 FG Carl Zeiss AG. All pH measurements were performed using the Mettler Toledo pH meter. Samples were centrifuged using the Jouan C1000_S5 Centrifuge. Fluorescence emission was measured at an excitation wavelength of 295 nm and emission wavelength of 500 nm.