

## Nano-Encapsulation of Herbal Extracts using tFOCUS System

### Introduction

The enrichment in bioavailability of the drugs is one of the most important concerning aspects of the pharmaceutical industries. Poor water soluble drugs require more time to dissolve in the gastrointestinal fluid under normal condition that may delay the absorption of the drug to the systemic circulation. The bioavailability of the drug is highly depending on the rate of dissolution which can be improved by preparation of these drugs in nano or micro particles due its uniform particle shape with narrow particle size distribution. The benefits in the preparation of nano formulation using Sonochemistry are.

- Facile, green and nonhazardous synthesis
- Rapid reaction rates
- Controllable reaction conditions
- Capable to achieve nano particles with a uniform shape and narrow size-distribution in large scale

It's evident that ultrasound energy will not produce any deleterious effect to the active constituents of herbal extracts and no undesirable changes in the drug molecules. Keeping this in mind CSIO designed and developed a new prototype semi-automatic temperature and flow control ultrasonic spray (tFOCUS) system to enhance bioavailability of poorly water soluble multi-herbal extracts (Model Drug: AYURSULIN) for Pharmaceutical industry.

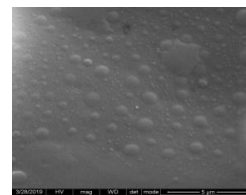
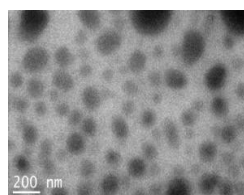


Working prototype of semi automatic temperature and flow control ultrasonic spray system consists of (i) Ultrasonic power supply with sonohorn probe (ii) Double wall glass reactor with inlet and outlet (iii) Temperature Probe (iv) Microcontroller based monitoring and control module (v) Peristaltic Pump 1 & 2 (vi) Reagent Bottle 1 (solvent) & 2 (anti-solvent) (vii) mechanical assembly for support and adjust the position of reactor (viii) Circulating water bath

## NANO- AYURSULIN FORMULATION

Commercial Ayursulin capsules used for treatment of Polycystic Ovary Syndrome (PCOS) which contains poor water soluble multi-herbal extracts.

To enhance bioavailability Ayursulin capsules contains herbal extracts, herewith prepared nano-encapsulation of five herbal extracts



TEM image of ZEIN encapsulated herbal extracts, size range of 80 to 260 nm (*left*) and

SEM image of PVA encapsulated herbal extracts, size range of 110 to 380 nm (*right, Scale bar 5 μm*)

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