A METHOD FOR PREPARING MICROGRANULES AND THE MICROGRANULES PRODUCED THEREBY

IITM Technology Available for Licensing

Problem Statement

- Microgranules are tiny particles that can carry medicines, nutrients, or other active agents. They are important because they allow controlled release, protect sensitive compounds, and improve stability across industries like pharmaceuticals, food, and cosmetics.
- Traditional methods like spray drying and fluidized bed granulation are widely used to make microgranules depends on high temperatures and costly equipment, which can damage delicate drugs and vitamins.
- Existing techniques such as supra-particle aggregates or wet chemistry techniques these methods often require harsh chemicals, complex steps, and are not suitable for large-scale.
- There is a demand for a simple, low-cost, and scalable method to prepare microgranules without heat or toxic solvents. This invention meets such a need by working at room temperature, protecting sensitive drugs, and allowing precise control of release.

Intellectual Property

- **IITM IDF Ref 3233**
- **IN 202541029935 Patent Application**

TRL (Technology Readiness Level)

TRL 4 Technology Validated in Lab

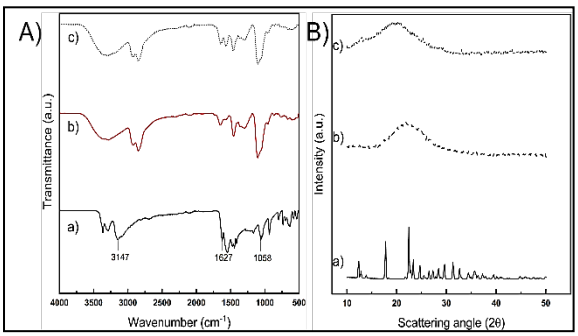


Figure : shows the **chemical characterization of the microgranules.** The **FT-IR spectra (A)** confirm successful drug encapsulation as evident from characteristics of metformin in the spectra. **The XRD spectra (B) reveal that pure metformin is crystalline**.

Technology Category/ Market

Category- Drugs & Pharmaceutical Engineering
Industry:
Pharmaceuticals Industry, personal care, paints, agriculture industry, and food industry.
Applications:
Catalysts, Advance materials, food and drugs , Agriculture.

Market report:
The **global microgranular market size** reached **USD 2.17 billion in 2024** and is expected to grow at a robust **CAGR of 7.2%** during the forecast period, reaching approximately **USD 4.09 billion by 2033**.

Research Lab

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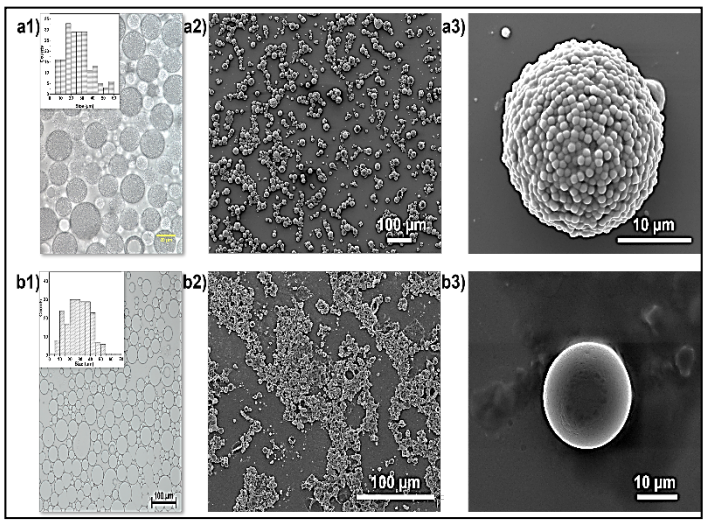


Figure : shows the **structure and morphology of the microgranules**. optical microscopy image of emulsions containing silica particles **(a1)**. The SEM images of drug loaded **silica particle granules (a2, a3)** display **rough, stable surfaces with embedded particles**. In contrast, granules without silica **(b1) collapse after drying (b2) indicating weaker morphology. The surface of the microgranule (b3) appears smooth**

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Technology

Particle Dispersion

Mix **water and silica particles** to create a stable dispersion. This forms the base material for the capsule.

Polymer Coating + Crosslinking

Add a **polymer** (like PEI, chitosan, or PLL) to coat the particles, then introduce a **crosslinker** (like BDE). This strengthens the particle suspension by forming a network.

Drug Incorporation

Dissolve a **hydrophilic active agent** (e.g., metformin, dopamine, vitamins) into the suspension. The drug gets trapped inside the forming capsule.

Emulsification in Oil Phase

Pour the suspension into an **oil phase (n-decane + surfactant SPAN 80)** and homogenize at high speed. This breaks the mixture into tiny droplets that become microgranules.

Crosslinking & Drying

Let the emulsion sit at **room temperature** so crosslinking occurs, then dry the solid residue at **40–70°C**.Final solid microgranules are obtained with controlled release properties.

Key Features / Value Proposition

1. The invention uses a **room-temperature process (20–40°C) with mild drying (40–70°C),** avoiding **high heat (80–120°C)** and protecting sensitive vitamins and biopolymers while saving energy.

2. Produces **controlled-release microgranules for hydrophilic drugs**, with tunable release profiles by adjusting particle and polymer ratios, **achieving 40% release in 15 minutes and 80% in 3 hours**.

3. The method defines precise **composition ranges** — **drug (0.1–0.5 wt%), polymer (0.5–1 wt%), crosslinker (0.3–0.8 wt%), silica (1–5 wt%),** and oil **phase (70–85 wt%),** ensuring reproducibility and customization.

4. The resulting microgranules have **particle sizes between 15–60 µm**, **mostly 15–30 µm**, giving uniformity and predictable performance compared to conventional methods.

5. Enables **versatile drug loading** (metformin, dopamine, acetaminophen, diclofenac, diltiazem, papaverine, vitamins), offering **a scalable**, **solvent-free**, **cost-effective process that eliminates the need for expensive equipment.**

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