

Silymarin Complex as a Potential Drug Formulation for Intestinal track Inflammatory Diseases

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Introduction

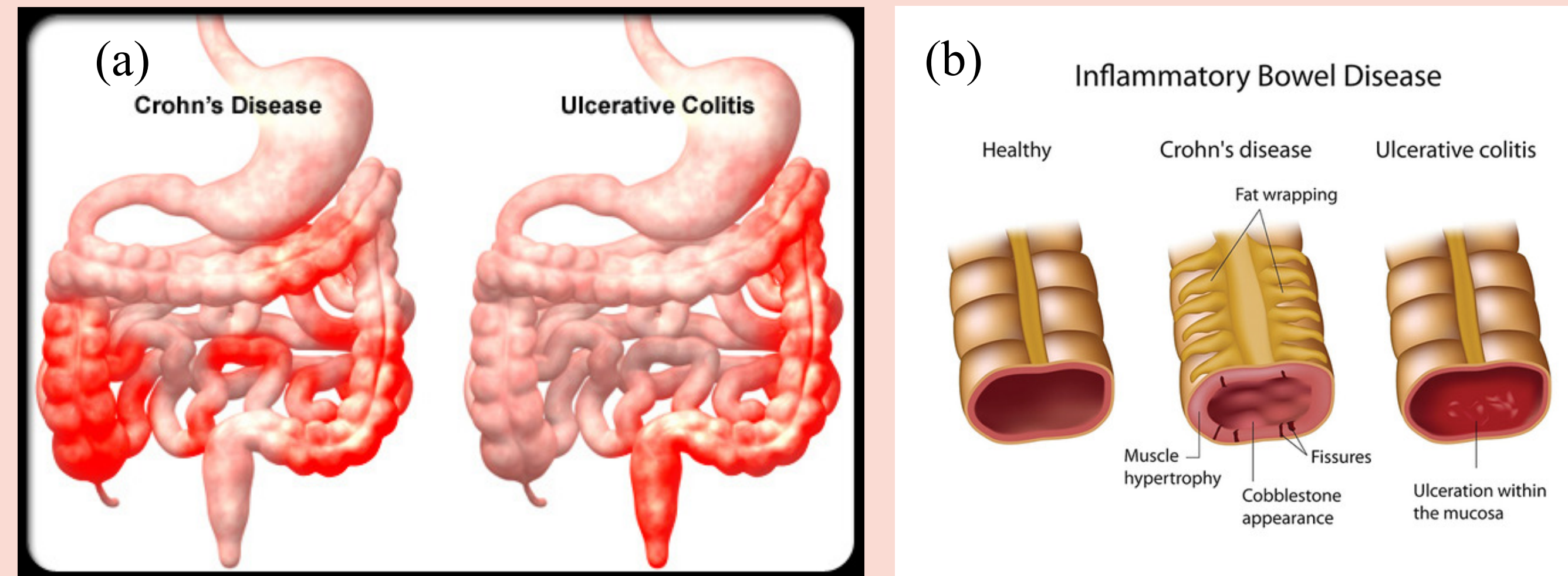


Figure 1. (a) Effects of Crohn's Disease & Ulcerative Colitis on GI Tract (b) Scope view of IBD

Crohn's Disease and Ulcerative Colitis are cumulatively known as Inflammatory Bowel Disease (IBD), they are distinguished by inflammation in the gastrointestinal tract. A survey from 2017 stated that 57% of IBD patients were originally misdiagnosed, since the symptoms can suggest many things.¹ Symptoms include²

- Cramps, Abdominal Pain
- Blood in stool
- Diarrhea, Constipation, bloating
- Visceral Hypersensitivity
- Fever, fatigue
- Unintended weight loss
- Intestinal Inflammation

As stated by Nature Reviews Gastroenterology & Hepatology, more than one million people in the United States and over two and a half million people in Europe are presumed to have IBD.³

- Since the twentieth century, Ulcerative Colitis and Crohn's Disease has significantly increased in the western world.
- The prevalence in the Western world has now increased to 0.5% of the entire population.⁴
- Recently, IBD has evolved into a global disease and its prevalence in every continent continues to grow exponentially.

Treatment Disadvantages

Corticosteroids/ Amino salicylates

Immune System Suppressors

TNF- alpha Inhibitors

Surgery

Fig 3. Steps taken for treatment of IBD and their disadvantages⁵

The drug being formulated a natural antioxidant and less damaging than the medications listed above.

Experimental Results

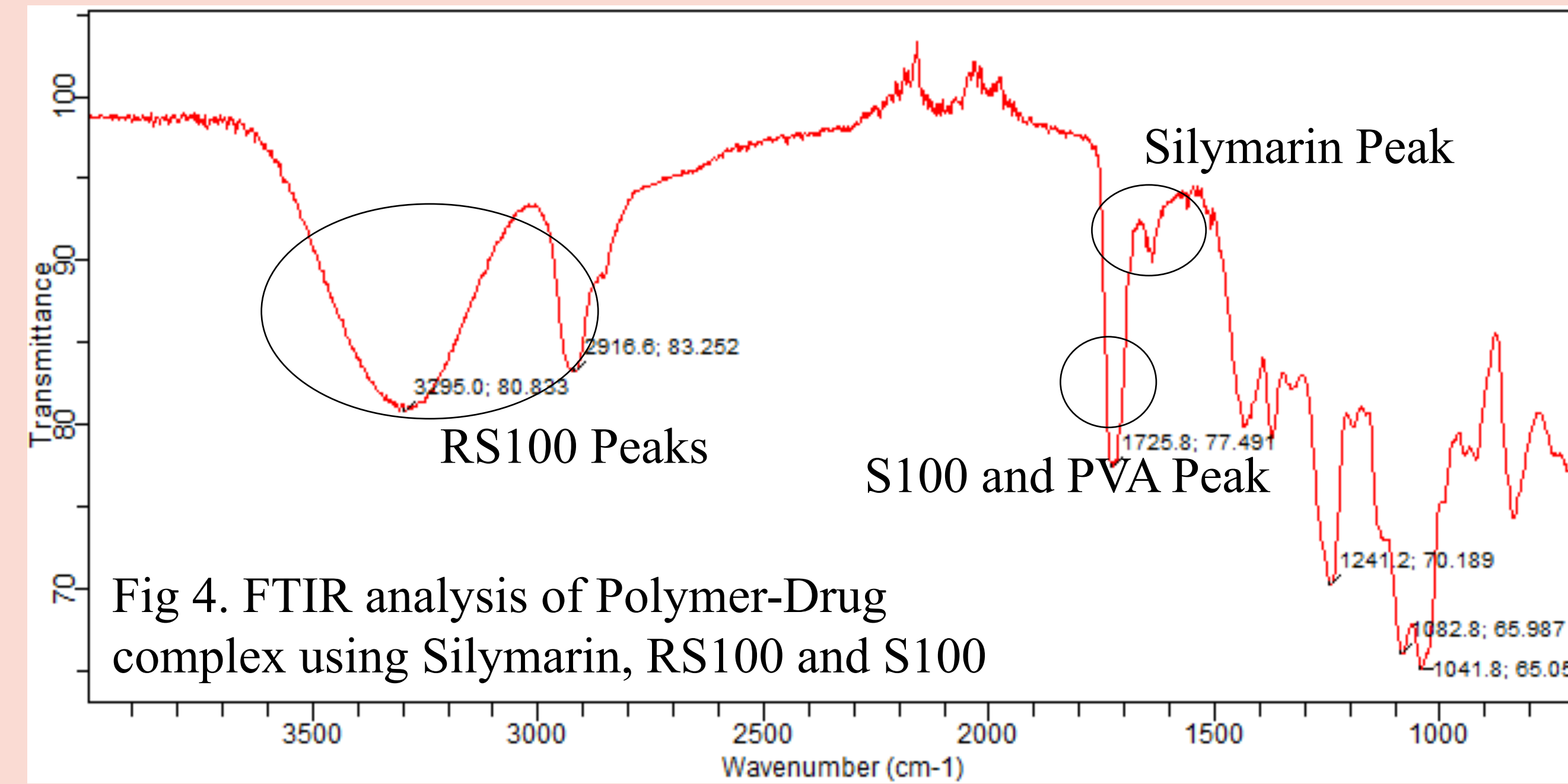


Fig 4. FTIR analysis of Polymer-Drug complex using Silymarin, RS100 and S100

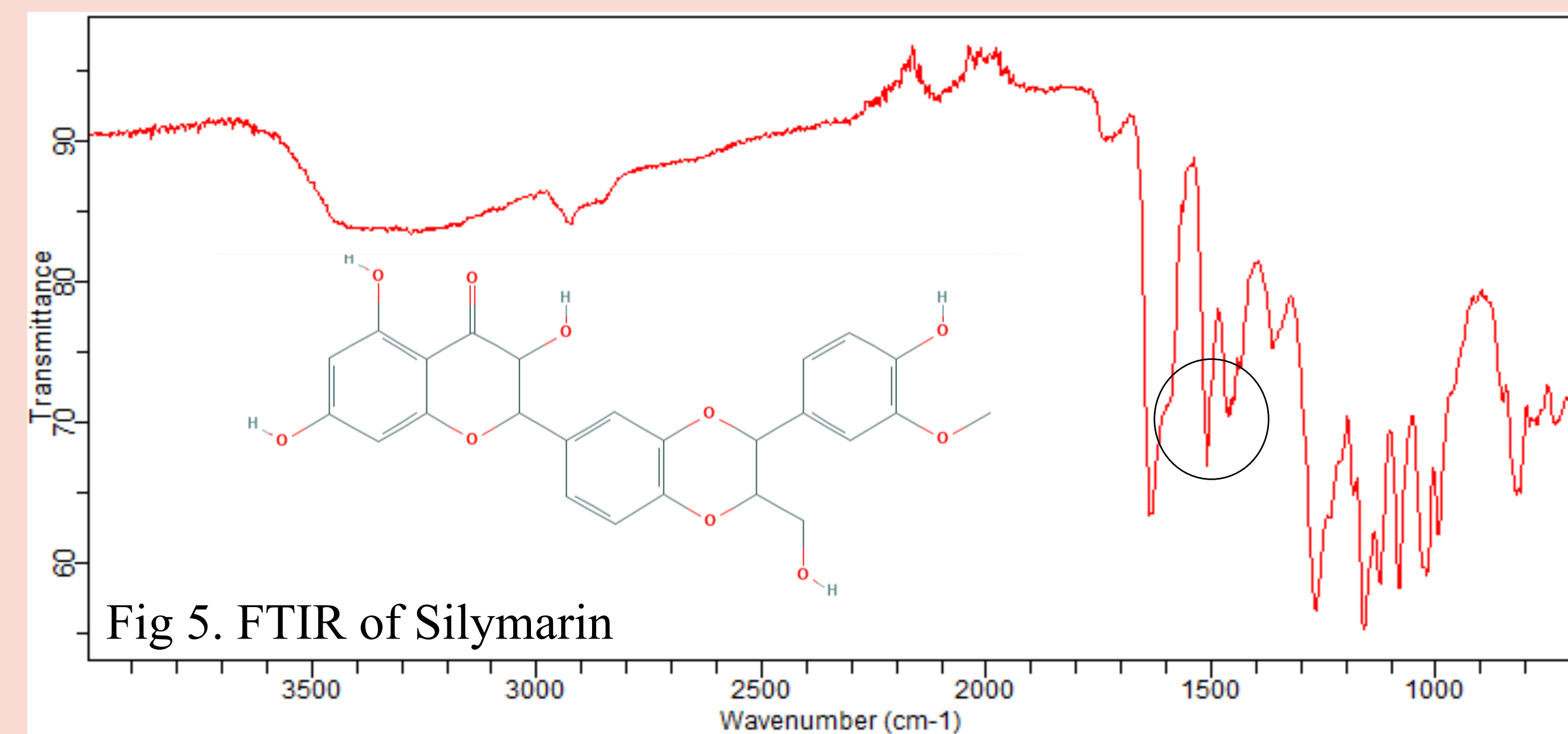


Fig 5. FTIR of Silymarin

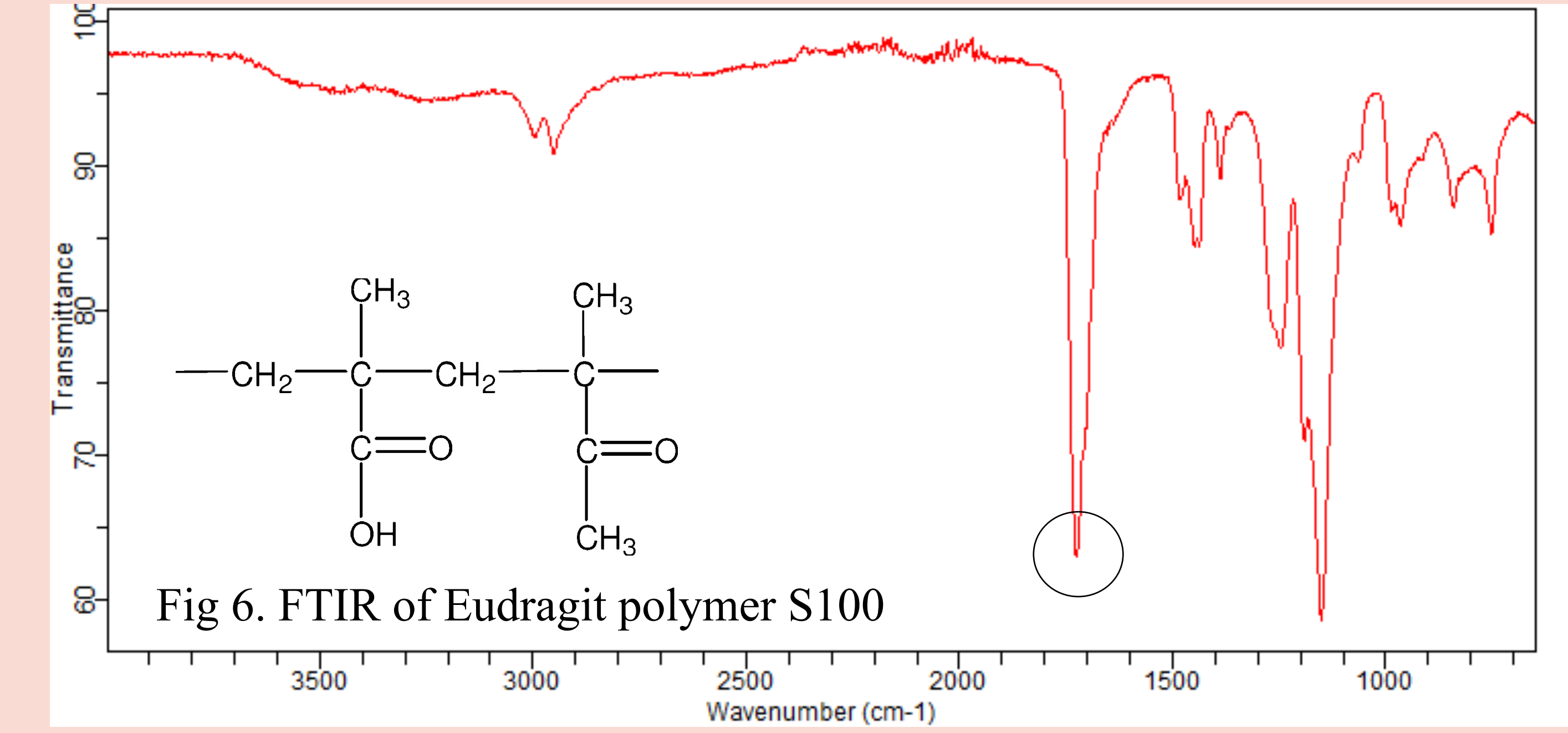


Fig 6. FTIR of Eudragit polymer S100

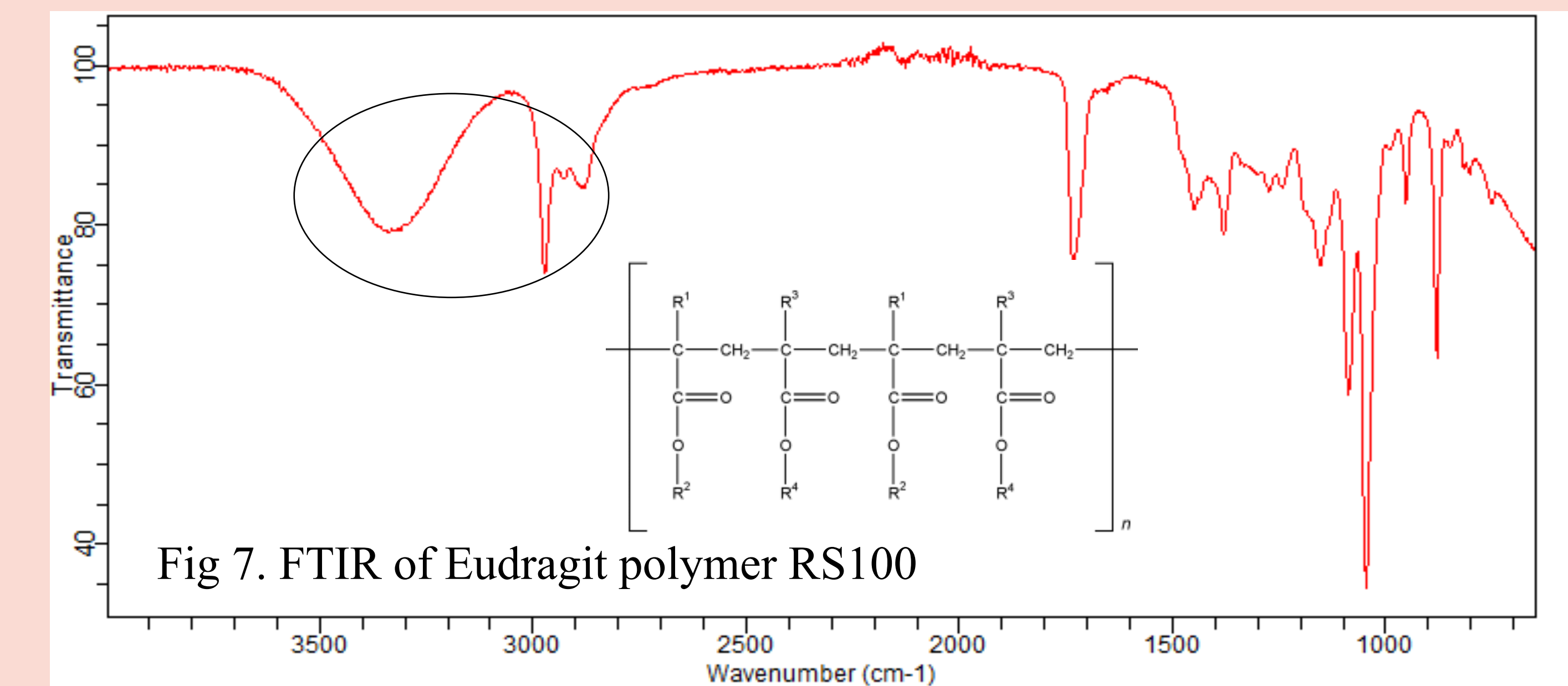
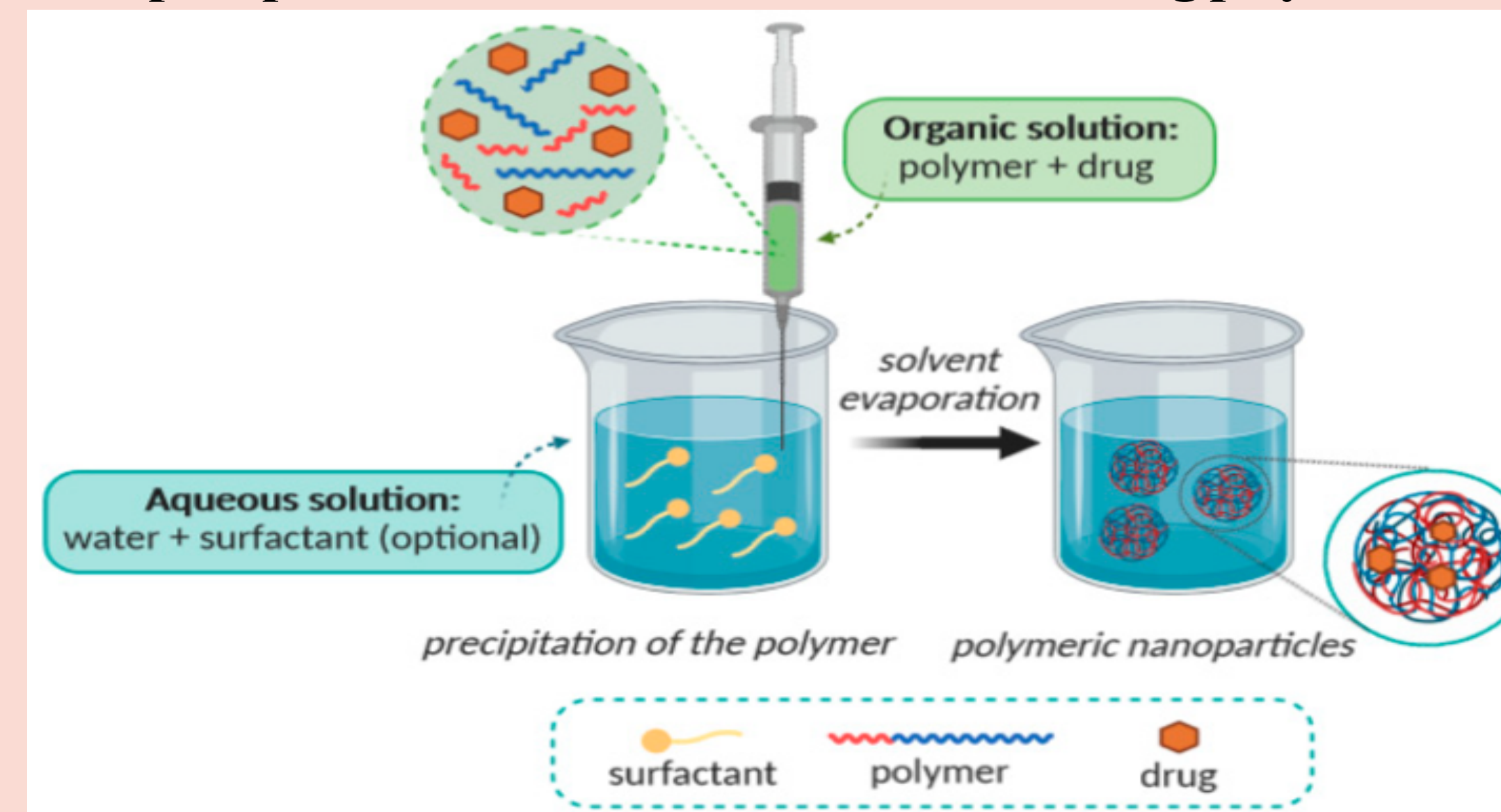


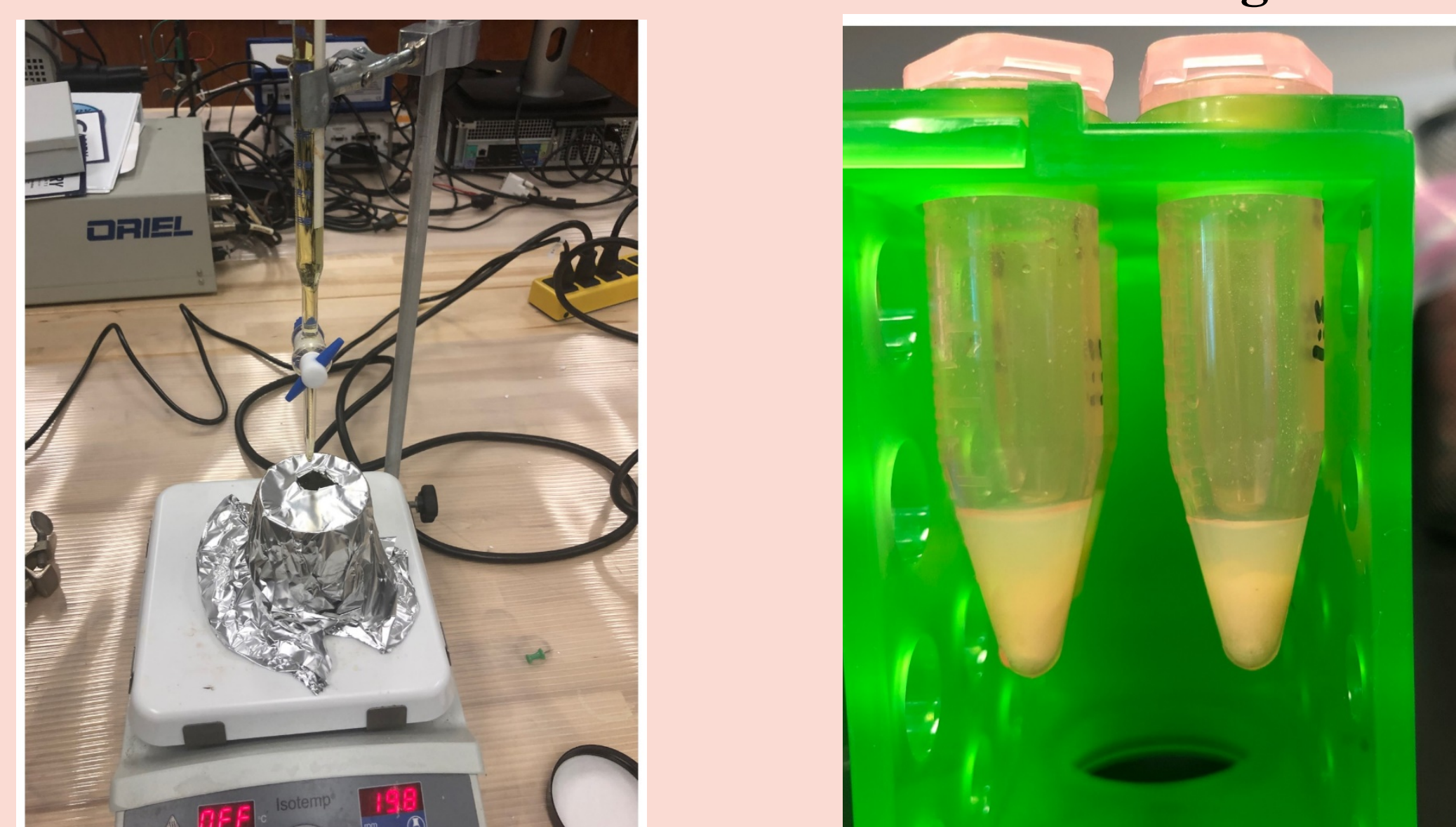
Fig 7. FTIR of Eudragit polymer RS100

Formulation

The nanoprecipitate method was utilized to form a drug polymer complex.



The drug, polymer and solvent solution was added dropwise into a vial of stabilizer and water under constant stirring.



Drug: Silymarin Polymers: RS100/S100, 3:1 Solvents: Acetone/Ethanol, 7:3 Stabilizer: PVA Formation of precipitate after centrifuge.

Conclusions

Based on scientific literature, IBD is a chronic disease that does not have any treatments without considerable side effects. The purpose of the proposed drug polymer complex pH sensitive delivery system is to reduce inflammation of the GI tract in Ulcerative Colitis and Crohn's Disease. The complex formulation has been shown using the nanoprecipitation method with specific stabilizer, polymers and drug.

Future Outlook

In future experimentation, this project contains optimizing the drug release from the polymer using the pH dissolution test, drug loading, drug coatings at a range of different pH of the GI tract for release at specific times, and mice studies.

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