

## Physicists in Pharmaceutical Industry

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### ABSTRACT

The science of physics is understood to be very away from the Pharmaceutical Science. But in the real context, Physics is found to be most densely involved in the Pharmaceutical Science than any other field of science. Physics can be considered as a backbone that supports Pharmaceutical Science. The advance technology that describes that formation and its mode of action to the biological organ is Physics. The structure, action and result of Pharmaceutical material are explained by the theories of Physics.

**Keywords:** Pharmaceutical Physics, drugs design, pharmaceutical spectroscopy

### INTRODUCTION

What does a physicist do in pharmaceutical industry? Can he formulate new drug product, discover a new molecule and its activity or its pharmacology.

The application of physics is found in all areas of pharmaceutical science and physical pharmacy including pre-formulation, formulation design, and drug substance and drug product characterization. The physical characterization of pharmaceutical solids, in the use of spectroscopy for the study of Materials, and in all aspects of the polymorphism of drug substances all is impossible without physics.

### Pharmaceutical Technology

Technically physics is involved in pharmaceutical technology as solid state spectroscopy, X-ray powder diffraction, differential scanning calorimetry, polarizing optical microscopy, infrared absorption/transmission (Attenuated Total Reflectance, Fourier Transform IR) spectroscopy, UV/VIS absorption spectroscopy, Mass spectroscopy, Raman Spectroscopy, powder flowability evaluation, determination of

kinematic or equilibrium solubility, surface tension, conductivity and fluorescence excitation or emission spectroscopy and many more. This is what **Pharmaceutical Physics**.

Basically, the kinematics and the techniques that determine the effectiveness of the pharmaceutical molecule are all physics. The flow, solubility, release, disintegration, dissolution, refractive index all focuses on the importance of physics. We could find the dissolution of the tablet is very perfect when the paddle is at a particular distance ( $25 \pm 2\text{mm}$ ) from the tablet.<sup>[1]</sup> This is for the requirement of the adequate force acting on the tablet for dissolution. The use of specific shape, dimension and value shows kinematics of physics in the Pharmaceutical Science. The science behind analytical columns and its separation techniques, the technique of the detection of the molecules at a particular wavelength using UV/VIS detector is a part of the energy level calculation shown by the Bohr's Atomic Model. The effect of temperature on the drug materials and the drug products is just a kind of thermodynamics.

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Going to the infrastructure level of a pharmaceutical industry, the use of pressure difference between the manufacturing room, filling room and the corridors are results of physics. Requirements of adequate humidity level and temperature can be taken as another example. The mixing techniques, sterilization process, compression process for tablet are also not away from physics.

### Pharmaceutical Physics Research

Pharmaceutical physics is one of the traditional research areas in the laboratory of industrial physics. The research began at 1980s. The research is based on the use of the versatile equipment of the laboratory as well as the Utility. The main techniques are thermo analytics, gas adsorption and x-ray diffraction. Some of the current research projects:

- Use of mesoporous materials in the drug delivery<sup>[2]</sup>
- The effect of crystallographic texture on the tablet properties<sup>[3]</sup>
- Development of novel moisture control system for powder containers<sup>[4]</sup>

- Use of electrostatic atomization in nanoparticle production<sup>[5]</sup>

### CONCLUSION

The article shows the requirement of physics in the Pharmaceutical science. Not only physics but also other fields of science come to play an important role. The burgeoning need for scientists in the pharmaceutical industry is fueled by the evolving nature of chemistry, biology, and physics, the applications of which are best assisted by an understanding of the use of informatics. An education in science starts with mathematics, nowadays, certainly joined by information technology, and followed closely by the three key experimental sciences of physics, chemistry, and biology. Later on, the research dimension is added, constituting an instrument for the creation of new knowledge. The process involved is characterized by its mostly interdisciplinary nature, resulting from the expanding overlap between the basic scientific disciplines, a rapidly growing complexity, and the disappearing autarchy of individual laboratories.

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