



**Department of Chemical Engineering & Technology  
Indian Institute of Technology  
(Banaras Hindu University)  
Varanasi-221005 (U.P.), INDIA**

---

**Candidates' Declaration**

I, **Sanjay Singh**, certify that the work embodied in this Ph.D. thesis is my own confident work carried out by me under the supervision of Prof. R.S Singh and co-supervision of Prof. B.N Rai for a period from **August 2010 to April 2016** at Department of Chemical Engineering & Technology, Indian Institute of Technology (BHU), Varanasi, India. The matter embodied in this Ph.D. thesis has not been submitted for the award of any other degree/diploma.

I declare that I have faithfully acknowledged, given credit to and referred to the research workers whenever their works have been cited in the text and the body of the thesis. Further, I certify that I have not willfully lifted up some other work, paragraph, text, data, results etc. reported in the journals, books, magazines, report, dissertations, thesis, etc., or available at web-sites and included them in this Ph.D. thesis and cited as my own work.

*Date*.....

*Place: Varanasi*

**(Sanjay Singh)**

---

**Certificate from the Supervisor**

This is to certify that the above statement made by the candidate is correct to the best of our knowledge.

**(Prof. R.S. Singh)**  
Supervisor

**(Prof. B.N Rai)**  
Co-Supervisor