Evaluation of X-ray Diffraction (XRD) Patterns and Phase Identification in Chitosan Zinc Oxide (CZnO) Nanoadsorbent

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1. Introduction:
Chitosan is a biopolymer used for many industrial applications. Amino groups present in the chitosan serve as chelation sites for adsorption of hazardous elements. Thus, the binding of chitosan onto zinc oxide will probably yield another novel nanoadsorbent such as chitosan zinc oxide (CZnO)\(^{(1,2)}\).

2. Experiment:
Diffraction pattern of CZnO was recorded in the high angle of 2\(\theta\) range (5-70\(^{\circ}\)). X-ray source of copper k- alpha radiation (Cu\(\alpha\)) with 1.541 nm wavelength was used. The scan speed and step size of 0.3\(^{\circ}\)/min and 0.001 s, respectively were fixed\(^{(2)}\).

3. Results and discussion:
A definite line broadening of the XRD peaks indicated the material consists of particles in nano scale range. The diffraction peaks of CZnO indicated the nano crystalline nature and identical to the hexagonal phase with Wurtzite structure. The CZnO peaks at angle (2\(\theta\)) was ranged from 19.80 to 69.08\(^{\circ}\) correspond to the reflection from 4.48 to 1.35\(^{\circ}\) crystal planes. All the diffraction peaks are in good agreement with those of hexagonal Wurtzite structure of ZnO (JCPDS card 36-1451, 1986). This indeed revealed that, it was successful formation of nano sized chitosan/ZnO complex. The straight base line and sharp peaks of standard ZnO, chitosan and CZnO were merged with each other at 47.57\(^{\circ}\), 47.53\(^{\circ}\) and 48.38\(^{\circ}\) 2-theta angle. This indicated that, the CZnO composite was a well crystallined material compared with ZnO nano particles\(^{(2)}\).

Reference: