Synthesis of nano layer copper oxychloride on the surface of zeolite as Zeolite / $Cu_2(OH)_3Cl$ nanocomposite.

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Prior to 1994, large scale industrial production of basic copper chloride was devoted to making either a fungicide for crop protection or an intermediate in the manufacture of other copper compounds. $Cu_2(OH)_3Cl$ can be prepared by air oxidation of Cu(I)Cl in brine solution. The resulting Cu(I)Cl is then heated to 60 ~ 90 °C and aerated to effect the oxidation and hydrolysis. The product from this process is of fine particle with size of 1 ~ 5 μm and is usable as an agricultural fungicide [1]. Steward (1997) was modified the process by changing the conditions. The production is operated continuously under well-defined conditions (pH, feeding rate, concentrations, temperature, etc.). Product with good particle size is produced and can be easily separated from background salt and other impurities in the mother liquor [2]. In the above methods and all exiting technology generally use of hazardous and expensive raw materials, Also most of them use multistep reaction in non-ambient condition and high temperature cause to use high energy which finally are not environmental friendly and so economically.

In this work, Zeolite / copper oxychloride nanocomposite (zeolite / $Cu_2(OH)_3Cl$ – NCs) successfully was produced by synthesis of copper oxychloride nanoparticles ($Cu_2(OH)_3Cl$ - NPs) on the surface of zeolite using green quick precipitation method.$CuCl_2$, NaCl and NaOH aqueous solutions were applied for the synthesis Cu2(OH)3Cl - NPs and the reaction was done in bimedium aqueous suspension phase. The production of zeolite / $Cu_2(OH)_3Cl$ – NCs was performed under the mild condition and using friendly environmental raw materials as green chemistry method. The products was characterized using powder X-ray diffraction (PXRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM), energy dispersive X-ray fluorescence (EDXF) and Fourier transforms infrared spectroscopy (FT – IR). The results were confirmed the formation of various assay of Cu2(OH)3Cl-NPs on the surface of zeolite without significant difference in size of $Cu_2(OH)_3Cl$-NPs while were used different ratio of $CuCl_2$ and NaCl aqueous solutions amount to amount of zeolite.

This is first report for synthesis of zeolite / copper oxychloride nanocomposite [zeolite/$Cu_2(OH)_3Cl$–NCs].The reaction was performed under the ambient and mild conditions, using low energy, low cost raw materials also the reaction is friendly environment due to using of non-hazardous solvent and raw materials and inert residue which indicate the method is based on green chemistry. The product directly use as fungicide, catalyst and nano fertilizer and no need the formulation for decreasing the copper oxychloride assay.

[1] Richardson, H. W. Ed., Handbook of Copper Compounds and Applications. Marcel Dekker, Inc., New York, NY, U.S.A., 1997, 71.

[2] Steward, F. A. Micronutrients, Heritage Environmental Service, US. Micronutrient supplement. WO95024834, US5451414, US5534043, CN1147755A, CN1069181C (ZL 95192983.6) (b) Steward, F. A. Micronutrients, Heritage Environmental Service, US. Vitamin compatible micronutrient supplement. WO00032206.