Investigation of Carbon Dioxide Sequestration Potential of Pure and Nano Particles Doped Biochar

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Abstract: Ever growing population, excessive use of fossil fuel, extravagant deforestation and many other anthropogenic activities are playing adevastating role in climate change.As a result, the alarming value ofcarbon dioxide (CO_2)concentration, 409 ppm,has been observed. Climate change is leading to consequences of melting of ice, sea level rise, andan increase of greenhouse gas (GHG) emissions, which have increased the intensity and frequency of heat waves, droughts,andfires all around the world. Among the various solutionsthat can combat the issues of climate change, carbon sequestration has emerged as a promising solution in recent decades. Application ofsui-generistechniques of nanotechnology in wastewater treatment and carbon sequestration arethe major developments. The nano-doped biochar and pure nano-particles can play an essential role in capturing atmospheric CO_2.

This paper aims to examine the efficiency of biochar, nanoparticles and nano-doped biochar under the umbrella of carbon sequestration both at laboratory and field scales. Titania doped biochar was preparedby using titanium isopropoxide while iron doped biochar was preparedby using iron sulfate and iron chloride salts. Pure nanoparticles were produced by the sol-gel method. XRD, SEM, and TEM analyzed the physical characteristics of nanoparticles. Composite of these biochar and pure nanoparticles were added for the growth of peas (*Pisumsativum L.*) to manifest the effect of nanoparticles on its carbon capturing efficiency. After the experimental period of two months, the results were obtainedbythe titration method to test the carbon emission ratio of the soil having treatments. The results have demonstrated that carbon absorption ratio of nanoparticles > nano-doped biochar > pure black plum biochar. Thermogravimetric analysis (TGA) was conducted to assess the efficiency of the different concentrations of iron-doped biochar and control biochar for absorption of CO_2. The results have shown that doped biochar can play asignificant role to reduce the amount of CO_2 in the atmosphere.

Keywords: Environmental nanotechnology; Carbon dioxide Sequestration; Biochar; Climate Change; Nanoparticles