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Development of sustainable fertilizer with positive local and global impacts

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A project began in 2002 to investigate and demonstrate the methods of production at a continuous bench scale level and produce sufficient material for an initial evaluation of a potentially profitable method to sequester carbon dioxide. The novel process uses agricultural, forestry and waste biomass by extracting hydrogen using pyrolysis and reforming technologies conducted in a 50kg/hr pilot demonstration. The resulting experiments produced a novel enriched carbon sequestering fertilizer. A pyrolysis temperature profile was discovered that results in a carbon char with an affinity to sequester CO2 through gas phase conversion with mixed hydrated ammonia within the pore structures of the carbon char. A bench scale project demonstrated a continuous process fluidized bed agglomerating process. The patent pending process is particularly applicable to fossil fuel combustion as it also removes SOx and NOx, does not require energy intensive carbon dioxide separation and operates at ambient temperature and pressure. The method of sequestration uses existing farm/forest products, a power company and a farm fertilizer distribution infrastructure to deliver a fertilizer that has many long term soil restoration and crop production benefits. Up to seventy percent of the hydrogen produced can be used locally for fuel. The economic impacts of cycling local currency have been shown to increase job creation and regional wealth. The physical structure of the fertilizer's carbon material provides matrix for carrying and slowly dispensing adsorbed nutrients while sequestering the carbon for thousands of years. The global benefits from increasing rural job creation and soil restoration could reduce GHG buildup and social instability related to acquiring declining and limited fossil fuel reserves.

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