

Silicon Advances for Sustainable Agriculture and Human Health

New source of biogenic silicon from sugarcane bagasse

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This paper describes the generation of biogenic silicon from sugarcane bagasse ash (SCBA). Furthermore, silica was recovered from sugarcane waste using a modified thermochemical approach, that is, tetrapropylammonium hydroxide, and then reacted with magnesium in the magnesiothermic reduction process to produce biogenic silicon. The physicochemical properties of the produced nanocrystalline silicon were examined using Powder XRD (P'XRD), Raman spectroscopy, FTIR, TEM, and SEM. X-ray diffraction spectroscopy revealed a peak at 2θ of 28 corresponding to a 30 nm crystallite size. The Raman analysis revealed a pronounced peak at 510 cm^{-1} , indicating highly ordered silicon. The surface analysis revealed two distinct bands at 445 cm^{-1} and 1046 cm^{-1} , representing the Si-O rocking and Si-O-Si stretching behavior. Nanotechnology as an enabler has proved that SCBA as a sustainable and renewable resource can be used for the production of biogenic silicon.