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Preparation of Ceramic Composites from Plants

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Woody waste materials such as bark, wood powder and cellulose reagent were utilized for combustion synthesis or self-propagating high temperature synthesis of TiC ceramic or TiC-Al_2O_3 composite. The wastes were mixed with titanium and/or aluminum powders. Consequently, formation of TiC was confirmed in the system prepared at a composition ratio of C/Ti = 1 by X-ray diffraction experiments (XRD), while any oxide phase was not observed. It was found that combustion velocity of the mixture increased with relative content of carbon in the wastes. Shifting of XRD peaks and broadening of peak width, which means a formation of non-stoichiometric TiC with some lattice defects, were observed. Therefore, it was expected that a part of carbon component involved in the waste might be released or decarbonized as carbon mono- or dioxide during combustion synthesis. In order to suppress the generation of the gases such as carbon dioxide, the addition of aluminum powder as a deoxidizer to the system was attempted. As a result, it could fix the carbon element from the woody waste materials into ceramics without emission of carbon dioxide. Thus this process can be regarded as one of the clean processes in material synthesis.