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# Nanostructured boron carbide ($B_4C$): a bio-compatible and recyclable photo-catalyst for efficient wastewater treatment

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## Abstract

Carbides have noteworthy manifold properties, solely adjusted to the requirements of different users. Nanostructured Boron Carbide ($B_4C$) is one of them which possess unique characteristics to move towards industrial wastewater treatment from its traditional uses. Present work deals with the first photocatalytic study of biocompatible nanostructured $B_4C$ for organic (Methylene blue, MB) as well as industrial (Synazol yellow, SY) dye. The textile industry excretes non-biodegradable waste into water bodies, so effective and economical catalyst for the removal of industrial pollutants is the need of the hour. $B_4C$ shows remarkable results for the degradation of MB and SY dyes. The high degradation efficiency of 91.09 % and 76.04% was achieved with 0.5 g/L catalyst for SY and MB dyes respectively loading due to the presence of defect states in the material. The effect of concentration of catalyst loading on the extent of photo-degradation has been considered for this study. As the concentration of $B_4C$ catalyst increases, the number of active sites on the surface of catalyst also increased which leads to improvement in degradation of dyes. Reusability of the same catalyst showed good results for its cost-effective use. The toxicity assessment revealed superior biocompatibility of $B_4C$ nanostructures upto the concentration ~ 800 ppm. These findings indicate