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SiC/PMMA nanocomposites: properties and risk-health assessment

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Nanotechnology is an emerging science involving manipulation of matter at the nanometer scale. Last decades, the research work on new nano-structured materials and s new nanotechnologies has been intensively performed. Nanostructures have shown remarkable properties such as high thermal stability, excellent mechanical and electrical characteristics which allowed them to have a wide application in many areas. However, due to their nano-dimensions, nanoparticles are showing environmental and health impacts. In this work, the health impacts and risk assessment of the SiC nanoparticles were studied as well as the properties of SiC/PMMA nanocomposities. The toxicity of nano-sized SiC particles on 4 weeks old female Wistar rats was investigated in comparison with the vehicle-control group treated with 0,5% w/v HPMC. 2, 7 and 14 days later, animals from the control and 2 experimental groups were sacrificed (n=3 per group at each study period) after being anaesthetized by ether. For biochemical and hematological tests, blood samples were collected from the eye vein by removing the eyeball quickly. The tissues and organs such as heart, liver, spleen, kidneys, lung, brain, small and lower intestine, and ovary were excised and prepared in a 10% formalin solution for pathological diagnosis. All histopathological tests were performed using standard laboratory procedures. The slides were observed and the photos were taken using optical microscopy. SiC/PMMA nanocomposite properties were studied by TGA, FTIR and SEM techniques. SEM analysis has shown that SiC nanoparticels were well dispersed in the PMMA matrix and they show higher termal stability. The significant changes of serum LDH in both the experimental groups (app. 1580+30) in comparison with the control group (550+70,71) could indicate myocardial damage, which was confirmed by the histological analysis. So, some of the nanoparticle safety data discussed in this work would suggest that researchers proceed with caution.