

Use of natural curcumin extracted from turmeric in determination of boron in steel

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Boron containing alloy steels are used in constructional, automotive and many other applications. The presence of even trace amounts of boron affects greatly on the properties of steel such as hardness and machinability. As the traces of boron affect the properties of steel, it is important to determine it accurately and precisely in the manufacture of these alloys. Due to the drawbacks of common advanced techniques such as Atomic Absorption Spectroscopy (AAS), Inductively Coupled Plasma-Atomic emission Spectroscopy (ICP-AES), the universally accepted method for determination of boron in steel is the spectrophotometric method using curcumin as an auxiliary agent.

Although curcumin is the most sensitive spectrophotometric reagent for the above analysis, synthetic curcumin is relatively expensive and it tends to degrade rapidly once it is exposed to air. Furthermore, this method is time consuming. One of the main objectives of this study was to investigate the possibility of using natural curcumin extracted from turmeric in the analysis instead of using synthetic curcumin.

Curcuminoids were extracted from turmeric (*Curcuma longa*) using soxhlet extraction and they were separated using column chromatography. Extracted crude, separated curcumin fraction and synthetic curcumin were analyzed using FTIR. FTIR spectra of synthetic curcumin and natural curcumin were similar to each other and the spectrum of extracted crude indicate the presence of more carbohydrate impurities. Finally the possibility of using natural curcumin in the analysis of boron in steel was determined using the method given by American Society for Testing and Materials (ASTM).

A boron-steel alloy sample found to be containing 0.26 ± 0.01 percent of boron with synthetic curcumin gave 0.25 ± 0.00 percent of boron with natural curcumin, indicating no significant difference in the determination. Cost analysis showed that it is more cost effective to use natural curcumin over synthetic curcumin. Findings of this study implies that natural curcumin extracted from turmeric can be used as efficiently and accurately as synthetic curcumin in the analysis and it is more cost effective in large scale industrial determination of boron in steel.

Keywords: Boron, Curcumin, Steel, Turmeric