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Opinion Article

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Study on the Tribological Properties of Porous Titanium Sliding against Tungsten Carbide YG6

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Introduction

Soil contamination with heavy metal content is a growing concern throughout the world as a result of industrial, mining, agricultural and domestic activities. Fungi are the most common and efficient group of heavy metal resistant microbe family which have potential for metal bioleaching. The use of filamentous fungi in bioleaching of heavy metals from contaminated soil has been developed recently. The current study intends to isolate a strain with the ability to degrade the pH value of the liquid medium. Identification results based on morphological and molecular biological analysis gave a 98% match to *Aspergillus flavus*. Batch experiments were conducted to select the optimal conditions for bioleaching process which indicated that 130 mg/L sucrose, neutral pH and temperature of 30°C were more suitable during 15-day bioleaching experiments using *A. flavus*. In one-step bioleaching, the bioleaching efficiencies were 18.16% for Pb, 39.77% for Cd and 58.22% for $Zn+^{2}$, while two-step bioleaching showed efficiencies of 16.91% for Pb, 49.66% for Cd and 65.73% for $Zn+^{2}$. Overall, this study indicates that bioleaching of heavy metals in contaminated soil using *A. flavus* has the potential for contaminated soil remediation. Due to high industrial expansion, large quantities of industrial wastes have been generated and improperly disposed without prior special treatments. Soil contaminated with heavy metals has recently become a serious concern in China and other parts of the world. Unlike many other pollutants, heavy metals are difficult to remove from the environment. These metals cannot be chemically or biologically degraded and are ultimately indestructible. Their transportation and accumulation in agricultural products pose a risk to food safety and human health. According to some reports, each year heavy metal contamination affects 100,000 km^2 of cultivated land and 12 Mt of grain in China. Throughout the world heavy metal pollution of soil is still a thoroughly unsolved environmental problem, and reliable remediation techniques are required for removal of toxic heavy metals. Various physical and chemical techniques have been developed for removal of metals from contaminated soils such as electrokinetics, solidification/stabilization and extraction techniques. Although these techniques have widely been applied in practice, disadvantages of these methods have been reported in several studies. By application of solidification method, heavy metal precipitation occurs in the soil with decrease in their bioavailability and mobility, but the remaining precipitates in the soil can be solubilized through change in soil environment; therefore, solidification may be a reason for secondary pollution. In extraction processes, chelators were mostly used; like the use of synthetic chelators such as ethylenediamine-tetraacetic acid in soil results in the improvement of both solubility and bioavailability of heavy metals. However, excessive use of chemical chelates resulted to pollution of the ground water and negatively affected soil quality as many necessary ions are also chelated unselectively. Hence, a simple and economically feasible technology is required for removal of heavy metals from contaminated soils.

Soil Characteristics

Sterile experimental conditions were achieved by autoclaving all the flasks containing modified sucrose medium at 12°C for 20 min prior to inoculation; the polluted soil was autoclaved separately. Oil was bioleached using the same liquid medium as mentioned above at 20°C, 30°C and 40°C. The efficiencies of bioleaching at different temperatures were compared by determining the metal concentrations in filtrates using AAS. Each temperature level was run in triplicate. Two methods of bioleaching were performed which were named as one-step and two-step bioleaching. In one-step bioleaching, the fungus was incubated together with the medium and sterile soil in a rotary shaking incubator for 15 days. In two-step bioleaching, pure culture of the fungus was run for 6 days, and then the autoclaved soil was added; bioleaching experiment was performed in a rotary shaker for 9 days. A control experiment was also carried out in parallel without inoculation. All the experiments were run in triplicate. To compare the difference of methods, one-way ANOVA at $p<0.05$ level of significance was applied by using least significant difference test in SPSS 16 software (SPSS, Inc.). Each method was performed in triplicate. High silicon (>1.5%) prepares with various syntheses were isothermally changed to bainite at 220°C and 250°C to deliver what is frequently alluded to as nanostructured bainite. Hindered elastic tests were completed and the held austenite was estimated as a component of strain. Results were related with tractable malleability. The job of held austenite dependability is strikingly underlined as emphatically influencing the affinity to weak disappointment, yet in addition the elastic malleability. A straightforward quantitative relationship is recommended that plainly delimitates the various practices (weak/bendable) and associates well with the deliberate flexibility. Ends are proposed regarding the job of held austenite division and the presence of an edge esteem related with malleable crack. The electropolishing conduct of 73 metal was contemplated through a pivoting chamber terminal (RCE) in a 70 vol % H3PO4 arrangement at 27°C. Attributable to the development of a blue Cu^{2+} rich layer on the metal RCE, an undeniable progress top was distinguished from motor to dispersion controlled disintegration in the anodic polarization bend. Electropolishing was led at the possibilities situated at the change top, the beginning, the center, and the end positions in the restricting current level relating to the anodic polarization bend of the metal RCE. An all around cleaned surface can be gotten after potentiostatic electropolishing at the center situation in the restricting current level. During potentiostatic drawing in the restricting current level, a blue Cu2+ rich layer was framed on the metal RCE, decreasing its anodic disintegration rate and acquiring an evened out and lit up metal RCE. Additionally, a pole climbing peculiarity of the blue Cu^{2+} rich layer was seen on the pivoting metal RCE. This upgrades the inclusion of the Cu2+ rich layer on the metal RCE and further develops its electropolishing impact clearly. The erosion of Ti-54M titanium compound handled by hot rotational swaging and present tempered on yield different grain sizes, in 2 M HCl arrangements is accounted for. Two strengthening temperatures of 800°C and 940°C, trailed via air cooling and heater cooling were utilized to give homogeneous grain designs of 1.5 and 5 μm, individually. It has been tracked down that strengthening the composite at 800°C diminished the consumption of the combination, concerning the hot swaged condition, through expanding its erosion opposition and diminishing the erosion current and erosion rate.

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