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NOVEL IMMOBILIZATION OF PSEUDOMONAS AERUGINOSA ON GRAPHENE OXIDE AND ITS APPLICATIONS TO BIODEGRADATION OF PHENOL EXISTING IN INDUSTRIAL WASTEWATERS

A new biodegradation method for removal of phenol and its derivatives has been considered. In this study the biochemical pathway involved in degradation of phenol through Pseudomonas aeruginosa bacterial cells which are immobilized on graphene oxide (GO) has been investigated. Since phenol is a toxic substance and eliminating it through a biological method is difficult, the phenol removal ability of the bacterial cells of P. aeruginosa has been considered in comparison with phenol adsorption on graphene oxide as a nanostructured adsorbent and P. aeruginosa supported on GO as a new biochemical adsorbent. For this purpose, graphene oxide was initially synthesized using the modified Hummer's method and the bacterial strain was supported on GO. Scanning electron microscopy was employed to identify their morphology and structure. Also surface functional groups were initially analyzed by FTIR. The variables involved in the phenol removal process including phenol initial concentration, adsorbent dosage, temperature. The best removal efficiency of the bacteria was carried out at optimum conditions of pH7, biosorbent dose of 0.01 g and phenol initial concentration of 3 ppm after 45 min of contact time at 25°C and up to 55 % of phenol was removed. Using 0.01 g of GO and using 0.01 g of P. aeruginosa/GO attained to this removal efficiency at pH7 after 60 and 45 min of contact time, respectively, whereas the removal efficiency of the modified biochemical adsorbent of P. aeruginosa/GO was up to 92 % at pH3 after 45 min of contact time. At the same condition phenol degradation using free cells of P. aeruginosa and using GO nanoparticles were 10.15 and 88.63 %, respectively. Pseudo-second order kinetics described the biodegradation of phenol by P. aeruginosa supported on GO.

Keywords: biodegradation, immobilization, phenol, graphene oxide, Pseudomonas aeruginosa

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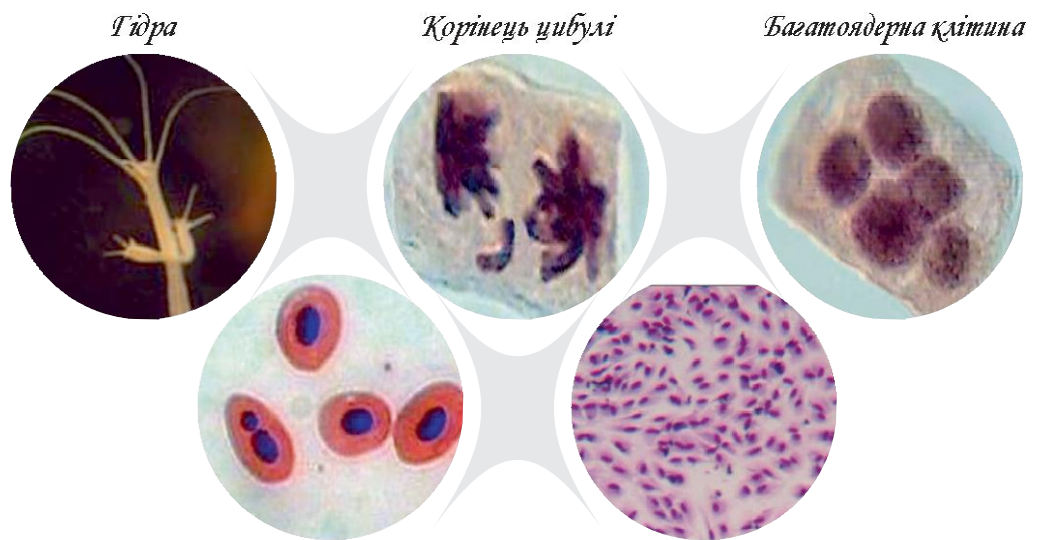


**ІНСТИТУТ КОЛОЇДНОЇ ХІМІЇ
ТА ХІМІЇ ВОДИ
ІМ. А.В. ДУМАНСЬКОГО
НАН УКРАЇНИ**

**ГЕНЕТИЧНО БЕЗПЕЧНА ПИТНА ВОДА.
ВИМОГИ ТА МЕТОДИ КОНТРОЛЮ ЇЇ ЯКОСТІ**

Новий узагальнений інтегральний метод оцінки якості питних вод об'єктивно характеризує їх безпеку для здоров'я людини. В його основі закладені оцінка загальної токсичності, гострої і хронічної токсичності, цитотоксичності, генотоксичності на рівні організму і на клітинах крові та інших органів прісноводних організмів.

Вимоги до якості такої води включають 75 показників і представлені 10 окремими групами.



**Інститутом розроблено
Національний Стандарт України
«ВОДА ПИТНА.
Вимоги та методи контролювання якості»
ДСТУ 7525:2014**

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