

胡振琪,李 玲,赵艳玲,冯新伟.高潜水位平原区采煤塌陷地复垦土壤形态发育评价[J].农业工程学报,2013,29(5):95-101

高潜水位平原区采煤塌陷地复垦土壤形态发育评价

Morphology development evaluation of reclaimed soil in coal-mining subsidence areas with high groundwater levels

投稿时间: 2012-09-20 最后修改时间: 2013-01-19

中文关键词: [土壤](#), [复垦](#), [矿](#), [土壤形态发育评价](#), [土层发育指数](#), [权重剖面发育指数](#), [高潜水位平原区采煤塌陷地](#)

英文关键词: [soils](#), [reclamation](#), [mines](#), [soil morphology development evaluation](#), [horizon index](#), [weighted profile development index](#), [coal-mining subsidence areas with high groundwater level](#)

基金项目: 国家自然科学基金项目 (41201209)

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中文摘要:

土壤的形态特征含有丰富的环境信息,是环境变化与生态重建的重要依据,可以推断土壤发育的强弱。矿山复垦土壤为人工新土壤,可能构造出不同的土壤形态,土壤形态特征的研究对复垦土壤生产力的提高和复垦技术的革新具有重要意义。该文以高潜水位平原区采煤塌陷地复垦土壤为研究对象,探讨定量评价复垦土壤形态发育状况。研究采用实地调查和室内分析相结合的方法,依据中国土壤系统分类用土壤剖面描述标准,构建了复垦土壤形态发育评价体系,进行土壤形态定量评价。结果表明,形态发育指数HI(土层发育指数)和WPDI(土壤权重剖面发育指数)能够较好的反映复垦土壤与当地原状土壤的发育程度差异:复垦土壤土层发育指数HI和土壤剖面发育指数WPDI平均值分别为0.57、0.56,而当地原状土壤HI和WPDI的平均值为0.68、0.69,表明复垦土壤形态发育程度相对较弱;HI曲线形状异于原状土壤,表层于其他土层,不同复垦方式的WPDI显示的发育程度序列为:充填复垦(外源土)>挖深垫浅>挖深垫浅(泥浆泵)>充填复垦(粉煤灰、煤矸石等);随复垦时间的长,复垦土壤发育程度呈现增长趋势。

英文摘要:

Soil morphological characteristics contain abundant environmental information. It is an important basis for environmental change and ecological reconstruction and can be used to infer the strength of soil development. Reclaimed soil is man-made new soil and its morphological characteristics are related to reclamation methods, which is significant for renovating reclamation technologies and improving reclaimed soils. This paper involved conducted research on soil morphological characteristics and its evaluation method of soil morphology development for reclaimed soils in coal-mining subsidence areas with high groundwater level, which were reclaimed by four-type reclamation methods. These methods included digging deep to fill shallow areas by excavators, digging deep to fill shallow areas by use of a hydraulic dredge pump, filling reclamation with exogenous soil and filling reclamation with fly ash or coal wastes. The quantitative evaluation of the morphology development of reclaimed soil in coal-mining subsidence areas with high groundwater level was done by field investigation of 23 soil profiles and indoor analysis. The evaluation indicators and model were constructed based on the soil profile description standard of Chinese Soil Taxonomy (3rd edition, 2001). A soil morphology development evaluation index system was constructed to quantitatively measure the development degree of reclaimed soils. This evaluation index system combined features with six soil morphological properties based on morphological systematic observation and description for each layer soil. These six morphological properties are: color (hue, value and chroma), texture type, consistence (stickiness and plasticity), structure type, soil intrusions and horizon boundary (visibility at transition). On the basis of these indicators, the HI(horizon index) and WPDI (weighted profile development index) were developed preliminarily. The study then tried to research the reclaimed soil development status with a simple quantitative method. The results show that the horizon index (HI) and the weighted profile development index (WPDI) can reflect the difference of soil development degree between reclaimed soils and local original undisturbed soils. The HI and WPDI average values of reclaimed soil are 0.57, 0.56, and the value of local original undisturbed soil are 0.68, 0.69, which shows that the reclaimed soil formation development level is relatively weak. The HI shape of reclaimed soil significantly differs from local original undisturbed soil, which indicates the different forming and developmental process between them, and the surface layer HI general higher than other soil layer, it indicates the reclaimed soil as still in a weaker development phase. The development degree sequence of reclaimed soil based on WPDI reveals that: filling reclamation with exogenous soil > digging deep to fill shallow by excavators > digging deep to fill shallow by hydraulic dredge pump > filling reclamation with fly ash or coal wastes. With the reclamation time extension, the soil morphology development degree presents a growth trend. The resulting soil morphology development evaluation system is probably a convenient and effective method to evaluate the pedologic development degree of reclaimed soil in the field of coal-mining subsidence areas with high groundwater levels.

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