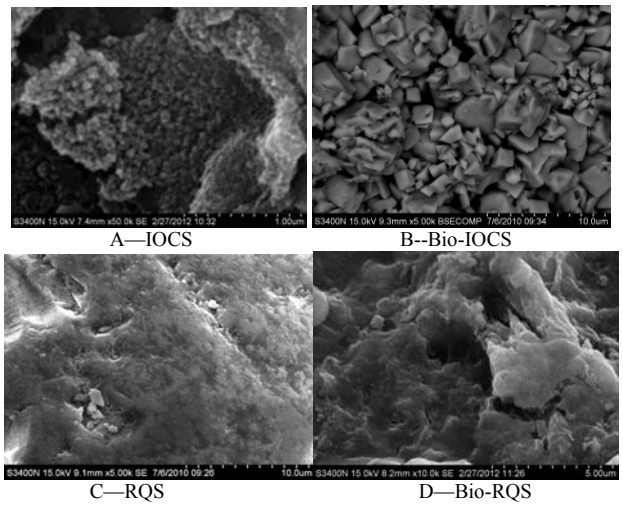
significantly. At the same Ammonia-Nitrogen concentrations, the removal rate of Bio-IOCS is obviously higher than that of Bio-RQS, for the large specific surface area of IOCS makes biofilm attached on the surface tightly and stably. Furthermore, nitrification bacteria in the biofilm have high activity and adsorption capacity.

D. Surface Morphological Characteristics of Bio-IOCS and Bio-RQS

As above mentioned, to remove Ammonia-Nitrogen from micro-pollution raw water, Bio-IOCS has noticeable advantages compared with Bio-RQS. The main reason is that surface morphological characteristics are different markedly (shown in Fig.6A-Fig.6D). The surface of IOCS presents more rough and porous structures (seen from Fig.6A), specific surface area significantly increases, covered with blocks of Fe_3O_4 (magnetite) oxide,. Improving the isoelectric point of filter media will lead to microorganisms firmly attached to the surface (seen from Fig.6B). Under the action of strong adsorption and interception capability of IOCS, and its biodegradation, the removal rate of Bio-IOCS to Ammonia-Nitrogen goes up notably. While the surface appearance of RQS is relatively smooth (shown in Fig.6C), it has small specific surface area and weak adsorption capacity. When microorganisms attached on it (seen from Fig.6D) , although surface roughness is enhanced, adhesion strength of the creatures on its surface is weak, lower biomass on RQS than on that of IOCS, which results in low removal efficiency.



A—IOCS B--Bio-IOCS

C—RQS D—Bio-RQS

Fig.6A、Fig.6C- magnification 5000

Fig.6B、Fig.6D- magnification 10000

Fig.6 The SEM photos of different filtration media

IV. CONCLUSIONS

a) The surface of IOCS and RQS can be successfully covered with microorganisms by compound biofilm formation technology. The removal efficiency of Bio-IOCS and Bio-RQS to Ammonia-Nitrogen is roughly 90%, which is higher than that of IOCS and RQS.

b) Both RQS and IOCS can be covered with enough biomass to ensure the stable operation of the filters. Biomass on the surface of Bio-IOCS is 1.34nmolP/(g sand), which is higher than that of Bio-RQS at stable formation stage.

c) The removal rate of Bio-IOCS and Bio-RQS to Ammonia-Nitrogen is nearly the same, around 95%, 92% respectively at the initial stage. The removal rate of Bio-IOCS to Ammonia-Nitrogen is approximately 20% higher than that of Bio-RQS. and the removal efficiency of Bio-IOCS can stabilize at 80% at the stable stage.

d) At the stable stage, when Ammonia-Nitrogen concentration varies from 0.5 mg/L to 4 mg/L, removal rate of bio-IOCS to Ammonia-Nitrogen is significantly higher than that of bio-RQS: removal rate increases from 70% to 95% for the former; 60% to 80% for the latter. At the same concentration of Ammonia-Nitrogen , removal rate of bio-IOCS is about 20% higher than that of bio-RQS.

e) The surface morphological characteristics of IOCS has more rough and porous structure, specific surface area significantly increases and microorganisms tightly attached to the surface. The attached biofilm makes the roughness and porosity on the surface of filter media increasing further, thus, it has stronger physical adsorption abilities and biodegradation and bio-oxidation capacities.

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