

Upcycling of solid wastes for wastewater treatment

Sungjun Bae

*Department of Civil and Environmental Engineering, Konkuk University, Seoul 05029,
Republic of Korea*

*) bsj1003@konkuk.ac.kr

ABSTRACT

Massive amount of various solid wastes has been produced worldwide from different industrial plants (e.g., coal fly ash from coal fired power plant, red mud from alumina production by Bayer process, and steel slag from steel plant). The solid wastes usually composed of various metal oxides which can be reutilized as sources of novel material synthesis. Herein, we selectively extracted many elements (i.e., Si, Al, and Fe) from the solid wastes or used them as support material for development of environmental clean-up materials. In particular, we i) synthesized nanoscale zerovalent iron from coal fly ash and used it for dye degradation by Fenton like reaction, ii) developed new zeolites and SiO₂ from coal fly ash and used them as support materials of noble metals for catalytic removal of organic (p-nitrophenol) and inorganic (nitrate) contaminants, iii) used red mud as peroxymonosulfate activator and photocatalyst enable to work under visible light irradiation for oxidative degradation of organic contaminants (antibiotics and phenol), and iv) used steel slag as support material of Cu nanoparticle for catalytic p-nitrophenol reduction. All the materials developed from this study showed a great performance in each treatment process which shows the potential conversion of solid wastes into much value-added materials.