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EDITORIAL

Sustainable Energy, Engineering, Materials and Environment: current advances and challenges

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This special issue of *Environmental Science and Pollution Research* consists of a selection of papers that were presented at the 1st International Research Conference on Sustainable Energy, Engineering, Materials and Environment (IRCSEEME) that was held at Northumbria University in Newcastle Upon Tyne, England, from the 26th to 28th of July 2017. This special issue presents perspectives and analyses on more efficient energy use, enhanced metallic material recovery, enhanced CO_2 capture, reducing carbon footprint, encouraging sustainable development through better urban planning and architecture, promoting initiatives to reduce environmental hazards and air pollution together with improving environmental and occupational policies to create a more sustainable work environment.

Asphalt emulsions are a better option for conventional paving processes because less energy is required therefore contributing to lower carbon emissions. Galan (2019) highlighted that the amount of 0.01 to 0.2 M of surfactant was required for a rapid-setting emulsions, and even larger quantities should be used for cationic quick-setting emulsions. Critical micelle concentration (cmc), solubility of ionic surfactants, and the capacity to be ionised are very important aspects of the emulsifier. The investigation found that the Krafft point is 20 °C. The critical micelle concentration was estimated in a range of 25–50 °C and the ionisation degree was obtained at the same range too. Other thermodynamic aspects were studied too, such as enthalpy and entropy variation and the variation of standard Gibbs energy of micellisation. This paper has shown that C12PCNS could be a good emulsifier for cationic quick-setting emulsions.

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Solar cell technology is the green technology utilising a renewable energy source. The growing use of solar cells which has a lifespan of 25–30 years is contributing to a huge amount of waste causing a challenge for future waste management. Currently, there are chemical methods for recovery of metals from solar cells but very little published material on bioleaching for metal reclamation from solar cells. Chankankar et al. (2019) reported on the recovery of metals from solar cells using *Penicillium chrysogenum* and *Penicillium simplicissimum*, highlighting that *Penicillium chrysogenum* was more effective in bioleaching metals from solar cell powder. The investigation concluded that bioleaching was a feasible process to recover valuable and base metals from spent solar cells to achieve the goals of resource recycling.

Sodium ceramics and lithium are being explored as potential CO_2 captors as they can capture CO_2 within a wide temperature range of 30–820 °C. Alkaline ceramics have also been trialled in catalytic reactions where chemically trapped CO_2 reacts with methane (CH_4) to produce syngas via the reforming process. Pfeiffer (2019) highlights the recent progress in CO_2 capture utilising alkaline ceramics, the use of ceramics for the CO oxidation capture process, and the methane reforming reaction for syngas production.

Sustainable development is an integral part of modern design found in design resiliency, ecologic, passive, and nearly zero energy buildings (nZEB) type buildings. The advancement and adoption of the sustainable approach in cities is reliant on the continued co-operation between architects, consultants, urban planners, and investors. There is also the important aspect of considering the health and well-being of the inhabitant of these sustainable developments which should be the main focus instead of increased energy efficiencies. The case study provided by Ryńka et al. (2019) espouses the success of transforming and modernising historical buildings in Poland by implementing nZEB utilising integrated concept designs for public buildings.

The degradation of NO_x from industrial emissions is a growing major concern for many countries. Catalysts such as Fe-zeolite, $V2O5/SiO_2$, and selective catalytic reduction (SCR) are employed commercially in the NO_x reduction process. In recent times, electroscrubbing using mediated electrochemical oxidation (MEO) is generating more interest because of the use of an electron as a catalyst. Gopal et al. (2019) have developed the combined MEO and mediated electrochemical reduction (MER) electroscrubbing method to improve the removal of NO. The results highlighted that the removal efficiency of NO to be close to 100% in the feed concentrations of 50–200 ppm. There is also the potential for similar results for higher feed concentrations and feed gas flow rate. It has also been shown that the combined MER and direct electrochemical reduction (DER) utilising Pt cathode enhances NO reduction.

As the number of retirees continue to increase in parallel to a declining working population, this places huge pressures on the social protection system causing it to become increasingly unaffordable. The study conducted by Abad et al. (2019) highlighted the various factors promoting health, improving the quality of workers' life, and then reducing the burden of chronic diseases. This comprehensive study puts interventions in place that address multiple risk factors and health conditions recognising that the interventions and chosen strategies can influence the individual employee and the whole organisation. It has been shown that by making work more sustainable, organisations can improve their competitiveness.

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