Poly(vinylpyrrolidinone)-iron magnetic nanocomposites as sorbents for effective oil removal from water

SM Shahrul Nizan Shikh Zahari[a]; Nik Fatin Nabilah Muhammad Nordin[a]; Muhamad Syukur Kamarudin[a]; Mus'ab Sahrim[b]; Mohd Muzamir Mahat[c]; Hazeeq Hazwan Azman[d]; Ramli Junid[e] and Nor Azam Endot[f]

[a] Faculty of Science and Technology, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia.
[b] Faculty of Engineering and Built Environment, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia.
[c] Faculty of Applied Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.
[d] Faculty of Engineering and Life Sciences, Bestari Jaya Campus, Universiti Selangor, Jalan Timur Tambahan, 45600 Bestari Jaya, Selangor, Malaysia.
[e] Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600, Pekan, Pahang, Malaysia.
[f] Department of Chemistry, University of Liverpool, Crown St, Liverpool L69 7ZD, UK

ABSTRACT

Poly(vinylpyrrolidinone)-iron magnetic nanocomposites (PVP-Fe NCs) were synthesised and used as sorbents for the removal of cooking oil from synthetic polluted water. The synthesised nanocomposites (NCs) contained particles with average grain size of 20 to 30 nm and possessed magnetic properties, as evidenced by field emission scanning electron microscopy (FESEM) and vibration sample magnetometer (VSM) analyses. The oil sorption studies revealed that the NCs are capable to remove up to ca. 80% of oil, and this remained constant irrespective of the total oil loading. Significantly, the oil-coated NCs were easily separated from "cleaned" water through a magnetic attraction using a N50 magnet. This approach, therefore, holds great potential to be scaled up and expanded to various water systems in Malaysia such as sea and river.

KEYWORDS:
Poly(vinylpyrrolidinone); iron magnetic nanocomposites; oil removal; vibration sample magnetometer (VSM)