Applying Solvent-Free Green Chemical Recycling of Plastic Waste for Corrosion Inhibitors for Steel Alloy

AlHamashi, Layan (School: The First Secondary School in Hail)

Strict environmental regulations and increasing awareness towards a safe future are the key driving forces towards the development of sustainable technologies. Today, more than 17% of the total solid waste, equivalent to 150 million tonnes/annum is composed of only plastic-based materials and considered as a major threat to the ecology as well as economy. Therefore, an urgent radical solution to curb this situation is highly required. An intriguing solution to this problem is the recycling and reuse of the plastic-based materials. In this work, I present recycling of polyethylene terephthalate (PET)-based waste materials using ethylenediamine (ED) under solvent free condition and a catalytic amount of sodium acetate. Under optimized condition, this chemical recycling method (aminolysis) yielded bis(2-aminoethyl) terephthalamide (BAETA) monomer (up to 95%) and aqueous layer (ethylene glycol), a side product. Structurally characterized BAETA monomer has been assessed as a corrosion inhibitor for the protection of mild carbon steel,(exposed to hydrochloric acid. Electrochemical results, supported by scanning electron microscope (SEM) data, indicated that BAETA could effectively inhibit corrosion in carbon steel with an efficiency of ~ 96%. Based on these results, I anticipate that this method has a potential to provide solutions to the environmental pollution resulting from accumulation of plastic waste. In addition, the resulting product can be used to tackle the problem of corrosion, which is an excellent benefit.