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Zn-doped hematite for solar hydrogen production

Hydrogen is emerging as the favourite alternative for fossil fuel. For the production of hydrogen, scientific community at large is involved in solar-induced splitting of water using the photoelectrochemical (PEC) route, in which semiconductor electrode plays the most important role. Search of a material that can drive the process of splitting is the key to the success of PEC hydrogen production. α-Fe_2O_3 has a unique set of properties that makes it a promising candidate as photoelectrode in the PEC cell, e.g. band gap in visible region, long term chemical stability in many solvents over a wide pH range, low cost and high oxidizing power. Even though the band gap of α-Fe_2O_3 is suitable for efficient absorption of incident solar radiation, its photoresponse is reported quite low, mainly due to high recombination rate of photogenerated charge carriers at the semiconductor/electrolyte interface.

Saroj Kumari *et al.* (**page 1062**) attempt to study the behaviour of nanostructured hematite, in PEC splitting of water. In this study, Zn-doped nanostructured α-Fe_2O_3 thin films were prepared over TCO glass substrates by spray pyrolysis. Investigators report that photocurrent density, which is a measure of hydrogen evolution rate, was improved largely by Zn doping and found to depend upon the doping concentration. The maximum photocurrent density was observed with 5 at.% Zn-doped samples. In this study the thin film samples were characterized for evolved phase, particle size, nature of charge carriers, band gap energy and resistivity. Besides the value of flatband potential, carrier density and depletion layer width are also determined through Mott–Schottky plots. The authors have demonstrated that Zn doping of α-Fe_2O_3 results in samples with increased resistivity, decreased donor density and increased flatband potential. The observed better photoresponse of Zn-doped samples has been attributed to the increases in flatband potential and depletion layer width.

Embryonic development in *Octopus*

In India, cephalopods started gaining importance with development of an export market and consequent increase in demand. The annual production of cephalopods was 1,04,354 tonnes valued at more than Rs 800 crores of rupees during 2002–03.

The body of *Octopus* is utilized for food while the tentacles and ink sac are used for biomedical research. Due to the heavy demand, various species of *Octopus* were successfully cultured in pilot scale circulating seawater systems for biomedical research. In India, *O. aegina* is caught throughout the year by fishers. Embryonic and larval development of this species is described by Ignatius and Srinivasan (**page 1089**).

Sustaining Indian agriculture

Indian agriculture has been successful in increasing foodgrains production in the past guided by the goals of 'self-sufficiency'. The mission of increasing foodgrains production stands somewhat achieved, however, accompanied by serious problems related to environment and natural resources. We have reached a point of time where we must seek out new directions – directions by way of strategies, policies and actions which must be adopted to move forward based on our learnings from the past. New directions are needed because past strategies are no longer taking the agriculture forward. This is because the nature and dimensions of the problems being faced today are much different and complex than which were faced in the 1960s and 1970s. Abrol and Sangar (**page 1020**) feel conservation agriculture offers a new paradigm for agricultural research and development – as a new way forward for conserving resources and enhancing productivity to achieve the goals of sustainable agriculture. This, however, demands a much enhanced knowledge base and a combination of institutional and technological innovations. This will call for greatly strengthened capacity of scientists to address problems from a systems perspective; be able to work in close partnerships with farmers and other stakeholders and strong knowledge and information sharing mechanisms. Conserving resources – enhancing productivity has to be the new mission.