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Comprehensive utilization of oil shale resources in China

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With the increasing demand for energy all over the world, the development of the global economy has been constrained by the shortage of oil resources. Oil shale is an important supplementary energy resource. In this paper, a comprehensive utilization system is recommended for the future use of oil shale, based on the current status of energy and the characteristics of oil shale. The system involves three components: retorting, electricity generation and ash processing. In the retorting model, coarse oil shale is retorted to shale oil, pyrolysis gas and oil shale semicoke by high capacity, efficient oil refining equipment. Electricity is generated by burning a mixed fuel of oil-shale semicoke and oil shale fines in a circulating fluidized bed (CFB) furnace. The pyrolysis gas has low calorific value and also can be used for combustion power generation. The oil shale ash from the CFB furnace is utilized to produce building materials, such as cement, brick and marble, as well as various chemical products (e.g. silica, nano-silica, alumina, nano-alumina) for preparation of high-tech products, such as multi-functional absorbent, luminescent and magnetic materials. The oil shale handling capacity of the proposed comprehensive utilization system is expected to be up to 3.0×10^6 t/a. Shale oil, gas and electricity outputs are estimated to be 0.2×10^6 t, 17×10^3 t and 120×10^6 Kwh, respectively. The product distribution for processed ash is approximately 60% for building materials, 30% for chemical products and 10% for other purposes, such as absorbents or soil conditioners. In summary, using the scheme described here oil shale can be efficiently utilized with virtually no solid residue left behind. Such an approach will be essential in the development of a green oil shale industry.