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SELECTION OF HEAT STORAGE MOLTEN SALT USED IN SOLAR TOWER THERMAL PLANTS

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Summary. *The advantage of molten salt being as the heat storage material of solar thermal plant is clear. With the advantages of solar thermal plant system especially the tower system being more and more apparent, the improvement of molten salts’ working temperature has drawn more and more importance too. Molten salts already existing and being used are mainly nitrates, however their admitted working temperature limitations can’t gradually satisfy the promotion of collector’s working temperature. The conception and theory together with three forms in existence are introduced, with analyzing of current salts, the selecting method of salts in solar tower thermal plant system and cautions in experiment are discussed too.*

By analyzing of research already published, it’s available to recognize that the tower solar thermal plant’s potential is still huge, as well as the space of optimization of the molten salt.

Nowadays the development of Solar heat plants is more and more accelerated, due to the problem of the shortage of energy as well as the emission of utilizing traditional energies. It is a cutting-edge technology transforming sun light to electricity by collecting the heat and propelling the turbine to generate electricity. However, the problem of the inadequate quality of molten salt is thorny which puts barrier to this technology’s development. This program is aimed at contributing to improve the molten salt’s quality.

After referring to existing research fruits, we drew some conclusions, which are as follows:

The main methodology of improving the capability of molten salt being the medium of heat flow is to reduce its melting point while increasing its boiling point. It is because salts block the tube at night or in other conditions without sun light, and in some extreme conditions with high temperature molten salts may decompose, causing serious damage to the whole system. As a result, the turbine and the circulation system will be hard to re-start. Hence, reducing the melting point while improving the stability in high temperature conditions is one of the most powerful solution towards this problem.

Moat accepted salts are nitrates, other than that, some are chlorides, but there is so few cases of molten salt applied being carbonates.

Compared with people’s preference utilizing nitrates and chlorides, carbonates have huge potentials. Today’s plants suffer from the low working temperature limit of nitrates and the corrosive effect using chlorides, while carbonates are much more suitable for high temperature conditions. Moreover, it has no or very little caustic properties, even though some of them may be prone to degrade in too high temperature (usually above 800 ℃, which is relatively hard for the solar plant heat collector to obtain.

The main reason that carbonates are not highly applied is that the melting point is too high, usually above 500℃, which exacerbate the block of tubes and turbines. After analysis, we noticed that increasing the complexity of components can effectively reduce the melting point of the mixture compared with the counterpart pure substance. It is probably because the force between atoms are weaken after the solid solution, or the fracture of bonds in associated molecules in pure crystals. Therefore, the growth of melting point due to the application of carbonates are purely offset.

In brief and to conclude, one of potential ways to improve the capability of molten salt in solar heat plants is to change the species of salts, especially applying multicomponent salts.

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