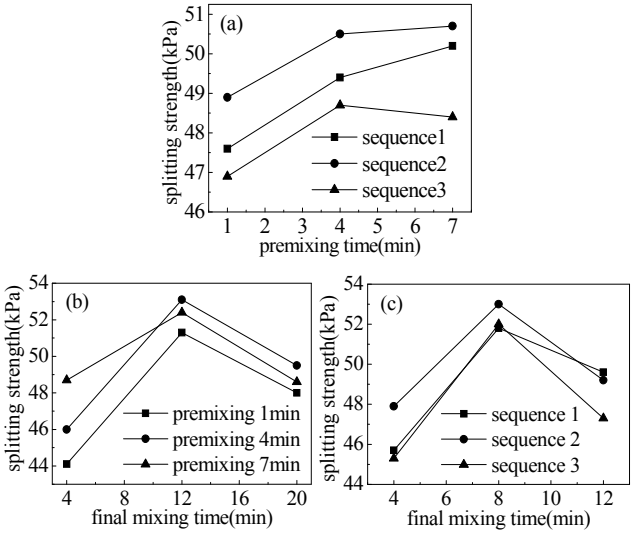

Figure 3 The interactive diagram of factors for green splitting strength: (a) premixing time and feeding sequence; (b) final mixing time and premixing time; (c) final mixing time and feeding sequence.

Fig.3 shows that the interaction of A×B does not exist while the interaction of A×C is too big. With the increase of the mixing time, the green splitting strength goes up and then down, which differs from the change of the green compressive strength. This mainly relates to the clay films. With the formation of the complete clay films, the green splitting strength will become bigger and bigger, and in the end it reaches up to the maximum. But the mixing time is longer, parts of the films will be destroyed due to the mechanical damage and the friction heat, and thus the splitting strength will reduce. Certainly, the film damage can also degenerate the green compressive strength. However, the coal plays an important role in enhancing the compressive strength with the mixing time extension, and this effect is much larger than the clay film damage. Therefore, the green compressive strength has been increasing. The optimal mixing process for green splitting strength drawn from Fig.2 is A2B2C2.

D. Shatter Index

The results in Table 2 indicate that the factor sequence of affecting the shatter index is C→B→A×C→A→A×B→B×C, namely, the final mixing time → premixing time → interaction between feeding sequence and final mixing time → feeding sequence → interaction between feeding sequence and premixing time → interaction between premixing time and final mixing time. The interactive curves of the factors for shatter index are shown in Fig.4.

It can be seen from Fig.4 that the interaction between the feeding sequence and final mixing time is very important, and there is no interaction between the feeding sequence and premixing time. According to the industrial requirement of about 80% shatter index, the optimal mixing process is that the sand and water are premixed 4 minutes, and then the clay and coal are added and mixed 12 minutes. If the efficiency is not considered, the process that the sand, clay and coal are premixed 4 minutes, and water are added and mixed 12 minutes can meet the requirement of about 80% shatter index.

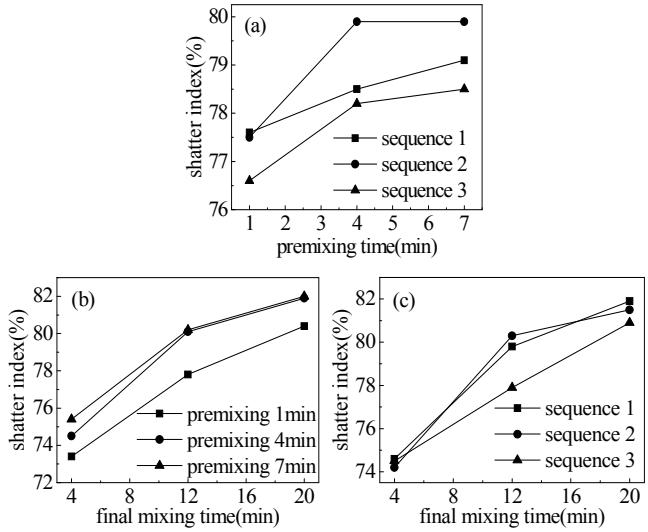

Figure 4 The interactive diagram of factors for shatter index: (a) feeding sequence and premixing time; (b) final mixing time and premixing time; (c) feeding sequence and final mixing time.

IV. CONCLUSIONS

The final mixing time is the main and important factor that affects the permeability, green compressive strength, green splitting strength and shatter index of green sand. Except the interaction between the feeding sequence and final mixing time that remarkably affects the shatter index, the influences of the other interactions are lower than the each process parameter. The influence of the feeding sequence is smaller than that of final mixing time on the permeability and green compressive strength while bigger on the green splitting strength. Considering these four property parameters, the optimal mixing process is that the sand and water are premixed 4 minutes, and then the clay and coal are added and mixed 12 minutes.

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