WHAT IS CLAIMED IS:

1. An SiC wafer producing method for producing an SiC wafer from a single crystal SiC ingot having an end surface, a c-axis intersecting said end surface, and a c-plane perpendicular to said c-axis, said SiC wafer producing method comprising:

a modified portion forming step of setting a focal point of a pulsed laser beam having a transmission wavelength to single crystal SiC inside said single crystal SiC ingot at a predetermined depth from said end surface, said predetermined depth corresponding to the thickness of said SiC wafer to be produced, and next applying said pulsed laser beam to said single crystal SiC ingot, thereby forming a small circular modified portion on said c-plane at said predetermined depth, said modified portion being a region where SiC has been decomposed into Si and C;

a separation layer forming step of forming a separation layer for separating said SiC wafer from said single crystal SiC ingot, said separation layer being composed of a plurality of continuous modified portions each formed by said modified portion forming step and a plurality of cracks isotropically formed on said c-plane so as to extend from each of said modified portions; and

a wafer producing step of separating a part of said single crystal SiC ingot along said separation layer as an interface, thereby producing said SiC wafer;

said separation layer forming step including:

a modified portion formation repeating step of repeating said modified portion forming step as relatively feeding said single crystal SiC ingot and

said focal point to continuously form said modified portions on said c-plane and also to isotropically form said cracks on said c-plane in a region where the relation of D>L is satisfied, where D is a diameter of each of said modified portions and L is a spacing between adjacent focal points in a feeding direction; and

an indexing step of relatively indexing said single crystal SiC ingot and said focal point in a range not greater than a width of said cracks;

said modified portion formation repeating step and said indexing step being alternately performed to form said separation layer, in which said cracks adjacent to each other in an indexing direction are connected.

2. The SiC wafer producing method according to claim 1, wherein said cracks are formed in a region where the relation of 0.75D>L>0.1D is satisfied, where D is the diameter of each of said modified portions and L is the spacing between the adjacent focal points in said feeding direction, in said separation layer forming step.

3. The SiC wafer producing method according to claim 1, wherein an energy per pulse of said pulsed laser beam to be applied in said separation layer forming step is set to 9 μJ or more.

4. The SiC wafer producing method according to claim 1, wherein said modified portions are continuously formed in a condition where said focal point is set on the same c-plane in said separation layer forming step.

5. The SiC wafer producing method according to claim 4, wherein

said c-axis is inclined by an off angle with respect to a normal to said end surface of said single crystal SiC ingot;

said modified portion formation repeating step in said separation layer forming step includes a step of continuously forming said modified portions in a first direction perpendicular to a second direction where said off angle is formed between said c-plane and said end surface;

said indexing step in said separation layer forming step includes the step of relatively indexing said single crystal SiC ingot and said focal point in said second direction in the range not greater than the width of said cracks, thereby connecting said cracks in said second direction.

6. The SiC wafer producing method according to claim 4, wherein

said c-axis coincides with a normal to said end surface of said single crystal SiC ingot;

said modified portion formation repeating step in said separation layer forming step includes the step of continuously forming said modified portions in said feeding direction;

said indexing step in said separation layer forming step includes the step of relatively indexing said single crystal SiC ingot and said focal point in said indexing direction in the range not greater than the width of said

cracks, thereby connecting said cracks in said indexing direction.