2.052 g of a metal carbonate, MCO_3, is decomposed according to the reaction equation below:

$$MCO_{3(s)} \rightarrow MO_{(s)} + CO_{2(g)}$$

If 0.4576 g of $CO_{2(g)}$ is produced, what metal is it?
Ba, Mg, Co, Cu, or Ca?

$$0.4576\,g\,CO_2 \left| \frac{1\,mol\,CO_2}{44.01\,g\,CO_2} \right| \frac{1\,mol\,C}{1\,mol\,CO_2} \left| \frac{1\,mol\,CO_3^{2-}}{1\,mol\,C} \right.$$

$$= 0.01040\,mol\,CO_3^{2-}$$

In the carbonate's formula MCO_3, there is 1 mole of M to 1 mole of CO_3^{2-}; so we will have 0.0104 mole of M^{2+} as well.

$$\frac{0.01040\,mol\,CO_3^{2-}}{1\,mol\,CO_3^{2-}} \left| \frac{60.01\,g\,CO_3^{2-}}{1\,mol\,CO_3^{2-}} \right. = 0.6241 \text{ grams } CO_3^{2-}$$

The total mass of the metal carbonate is 2.052 g.
Subtract 0.6241 g of carbonate, and
1.428 g of M^{2+} are present.

Molar Mass of M = g/moles = 1.428 g / 0.0104 mole

= 137.3 g/mole.

The metal is Barium.